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MOTOR SERVICING • THE BOMB METHOD OF EVACUATING AND CHARGING • SERVICE KINKS

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A Monthly Illustrated Journal Devoted to the Interests of the Refrigeration Service Engineer in the Servicing of Domestic and Small Commercial Refrigeration Systems and Oil Burners

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Cover

A portion of the hermetic rebuilding shop operated by Service Parts Co., Melrose Park, Ill.

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The Refrigeration Service Engineer

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Motor Servicing

By PAUL E. HAWKINS*

IF you have ever seen a rattlesnake strike, you will know it is usually sudden death when he connects. If you have ever seen electricity strike a man down, you will know it burns holes in his feet from the iron tacks in his shoes, and it buries the keys and coins that he carries in his pockets right into his legs. Thus electricity can be compared to a rattlesnake. Electricity, however, strikes without warning and should, therefore, be treated with even greater care than a rattlesnake.

Most refrigeration service men know very little about electrical science. They are usually breaking their local laws when they even disconnect a motor from the unit. However, with reasonable care and judgment a man can intelligently service all the electrical units on a refrigerator. Remember, however, that you can die just as quickly and just as surely from 110 volts as you can from 2300 volts. Maybe you have seen Bill Smith stick his finger in a light socket to test it for live juice and you are tempted at times when you are in a hurry to try it yourself. Remember that in doing so you are stroking a rattlesnake on the back of his head.

Service calls in general may be divided into three different groups: (1) Electrical apparatus to control electrical energy from the power meter up to the refrigerator. (2) Electric motor that runs a refrigerator. (3) Electrical apparatus to control electrical units in refrigerator.

GROUP 1—APPARATUS CONTROLLING ENERGY FROM POWER METER TO REFRIGERATOR

First thing to check is correct voltage for motor hook-up. This can be done very quickly. If motor is a capacitor type then name plate data will specify single voltage. If motor is repulsion induction type then motor usually is 110/220 volts. Leads in conduit box of motor will have to be checked to determine if motor is connected for lower or higher name plate voltage. Verify this hook-up with power. The best and simplest form of voltage tester is a 220 volt test light. It will shine brightly on 220 volts and dim on 110 volts. Fuses may be tested right in fuse panel if terminals are exposed. This light will not give any accurate test of voltage such as low or high voltage; only a reliable volt meter will do that.

GROUP 2—ELECTRIC MOTORS

Make these preliminary tests: First make as many checks as possible with motor connected to load. Keep a mental note of little

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things like motor starts OK but gets hot quick and has loud magnetic hum. If motor is dismantled and coils checked with growler, you will find a shorted stator coil. This will tie in with your check of motor on job. Motor gets hot because it draws more current due to short. It has magnetic hum due to unbalanced strength of field coils. If power is connected to motor without any break in either line, the motor will run or if motor does not run a loud hum will emanate from it. If motor refuses to turn over but hums, disconnect power immediately at disconnect switch or remove cord and plug from wall socket.

How to Look for Trouble

1. Motor does not revolve or will not start.

(a) *Condenser or starting switch defective.* If motor is capacitor type, condenser may be blown out, also starting switch in motor may be burned out. Condenser should be tested with condenser testing device. I defy any mortal living to guess the capacity of a condenser by sparking it between terminals. If no testing device is available the next best test is on the job. If motor starts load OK condenser must be OK, but if motor will not start and it has to be helped by hand, chances are that condenser is no good.

(b) *Bearings may be frozen,* if so motor cannot be turned over by hand. Stuck bearings may be determined by turning rotor by hand. Also dismantle motor for further tests.

(c) *Armature may be shorted,* if motor is repulsion induction type. This shorted condition may be caused by defective coils or mechanical trouble such as brush holder stuck out causing short circuiting mechanism to short out commutator. If armature of repulsion-induction type is shorted, it should be stripped of all shorting devices and brush holders before it is tested for shorted coils. To do this on the job a small portable growler is used. This is also used for testing shorted field coils. The growler is hooked up to 110 volt light circuit and placed on armature. If it causes hack saw blade to vibrate, then armature coils are shorted. However, some armatures have jumpers behind the commutator. This will cause armature to test shorted. If every coil tests shorted it denotes a commutator with jumpers. The proper way to test an armature of this type for shorts is with a wattmeter hooked up to the motor. The armature is assembled back in the motor complete all except for the short circuiting device and brush holder. Leave these parts out. With the full voltage applied to the motor as if to run it, turn the armature over slowly by hand. If the armature coils are shorted the wattmeter needle will be deflected where the shorted coil shows up. If no wattmeter is available the next best thing is to turn the armature over slowly by hand with motor hooked up and full voltage applied. If armature coils are shorted, armature will resist rotating. If coils are not shorted, armature may be turned over freely.

If governor pins are too long this will cause the short circuiting necklace to touch the commutator bars and short the armature out preventing motor from starting. Pins should be long enough to allow necklace to just clear commutator bars.

Three Phase Motor

(d) *If motor is three phase type,* failure to start can be either blown fuse in any one line or motor coils are shorted due to motor single phasing or in other words, running on single phase (two power lines instead of three) due to one fuse blowing. To test a three phase motor, a growler must be used. This way the shorted coil can be detected. If motor has run for any length of time on only two legs of hot line then coils will probably be cooked in sections showing one set of coils or two sets of coils burned out and one set of good coils. Motor has single phased due to one fuse blown out. Motor will have to be rewound completely.

2. If motor starts to run but labors hard and takes several minutes to lift brushes or starting switch, this can mean one of several things:

(a) *Armature in bad condition, solder thrown from commutator.* Visual inspection can denote solder melted and thrown out. This is caused by armature not being able to come up to speed quick enough and shorting out. Most probable cause is overload from high head pressure or other conditions causing overload on motor. After commutator is soldered and machined and new parts are installed and motor reconditioned like new again, the original trouble should be remedied or motor will still give trouble. Check for two large a pulley on motor. Best way to test for overload of motor is to take either wattmeter test or ammeter test. If motor draws more than 10 or 15 percent of name plate data,

load should be reduced or length of time motor runs should be reduced.

(b) *Brush holder set too far off normal neutral zone.* Best way to adjust brush holder for correct throwout is to set it in center of normal neutral zone so motor will not start and then move it one quarter inch or so in same direction motor is to run. Let motor come to complete stop again and start it up. If motor does not release brushes immediately move brush holder one eighth inch more. Brush holder should be moved and set where brushes kick out the best and in the shortest time. This can be done while motor is belted to load.

(c) *Brushes worn down too low or commutator badly burned,* also brush holder spring has lost its tension. Where brushes are badly worn, commutator burned and rough, this calls for shop job and comes under minor repairs. Brush holder springs may have lost their tension due to heat. This may be detected by pushing on brush holder to make motor come up to speed. This also comes under minor repairs.

(d) *Worn bearings allowing armature to drag on pole pieces.* This also causes motor to heat up excessively. If bearings are worn so badly that armature drags on stator iron, motor will draw more current than ordinarily and also heat up due to armature not being in center of magnetic field. Loss in speed also causes heat. If allowed to run in this condition for any length of time the laminations in both armature and stator core may be dragged out of place and forced into coils. This will either ground or short them out. To test for ground or shorted coil use the portable growler.

Condenser Start Motors

(e) *Weak capacitor.* If capacitor is weak, shorted or open circuited, motor will not start load but may run slowly. Test condenser with condenser tester. Motor should go into shop for minor overhaul including replacing of condenser. Never replace the condenser unit on job. To do so deprives you of added revenue and motor probably needs other work on switch points, etc.

(f) *Governor spring not adjusted for correct throwout speed.* If the governor spring is not adjusted for the correct time that it should release, the motor may not come up to top speed. The correct speed at which governor spring should operate is at about three-fourths of the synchronous speed of the motor. Synchronous speed of a four pole motor on 60 cycles is 1800 rpm; same motor on 50 cycles would be 1500. Three-fourths of 1800 is 1350. This is about the speed at which the governor mechanism should release for 60 cycle operation. Three-fourths of 1500 is 1125 rpm. This is about the speed at which the governor mechanism should release for 50 cycles. Fifty rpm one way or the other is OK. If the governor releases sooner than this speed the motor cannot develop enough torque to handle the load at the transition from repulsion to induction and pick up the necessary speed to carry it up to full load speed. The net result is that the motor loses speed rapidly and falls back on the brushes again. The governor may oscillate back and forth this way without carrying its load. If the governor releases later than the predetermined speed it may not release at all and would cause serious damage to armature. Too strong a governor spring is just as bad as one too weak. The governor should release in about one second and not later than four seconds. This data on governors holds true on all single phase motors.

Motor Heats

3. Motor starts and throws out brushes OK but gets too hot while running.

(a) *Shorted stator coils.* If stator coils are shorted, best way to test is by an inside growler. If growler is placed over stator coils and hack saw blade used, defective coils will be determined immediately. The small field growler can be carried in the service kit and motor dismantled on job and tested to enable service man to give customer correct price estimate. There should be no guess work in this test. Quite frequently shorted or grounded coils look OK and are not burned. The only way to determine if coils are defective is to test them with a growler.

(b) *Dry bearings or worn bearings causing armature to drag.* Bad bearings will cause motor to overheat because of armature dragging on stator iron. Worn bearings may be determined by dismantling motor.

(c) *Wrong hook up on stator coil leads.* If stator is hooked up for 110 volts and actually operates on 220 volts motor will heat up and sound very noisy. Of course

motor will burn up in short time. This condition could only occur on new installations or when any change has been made either on motor or electrical set-ups. If new motor or reconditioned motor is being installed, always check voltage with 220 volt test light at motor leads to determine the correct hook-up. If motor is hooked up for 220 volts and actually operated on 110 volts, motor will lack power to operate load. If motor is a repulsion-induction motor and four leads are brought out, some difficulty may arise sometime in getting the leads crossed up with their respective numbers or sequence. If this occurs, use this method to get them straightened out: Remember that there are two circuits in the stator. Four leads are brought outside for series or parallel connections. Use a test light or magneto to determine which two leads are a circuit.

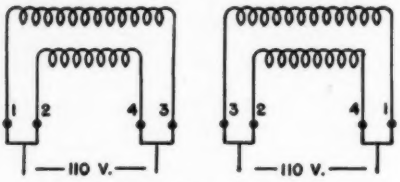


Fig. 1—Arrangement of motor leads.

After finding a circuit, mark one lead (1) and the other lead (3). The other two leads left will be a circuit also. Number them (2) and (4). Hook (1) and (2) together. Then hook (3) and (4) together. If motor operates OK on 110 volts, this is the right hook up. If it is wrong, motor will not run but hum loudly. Then reverse lead (3) with (1) and hook up again as originally. See Fig. 1.

(d) *Grounded stator coils.* If stator coils are grounded, motor will heat up and not carry load very well. Best test is with growler on coils. Stator will have to be rewound. This comes under the heading of major repairs.

(e) *Motor excessively overloaded.* If motor is overloaded more than 50 percent for two hours, motor will burn up. For long life of motor it should not be overloaded more than about 10 percent as it has peaks of overload at regular intervals such as starting up after defrosting. If load is greater than motor can handle, it will burn out. Best way to determine overload is by wattmeter method. Table 1 shows the approximate full load watts of single phase motors. These figures may be off one way or the other by about 10 percent due to efficiency of motor and power factor, but for all practical purposes may be used as a check.

(f) *High or low voltage.* If voltage varies by more than 10 percent either way, power company should be notified. If low voltage, motor will be weak, and if high voltage, motor will get too hot. Power companies are always ready to correct any condition that is not normal.

(g) *Belt too tight.* Setting belt on motor to compressor too tight may cause motor to heat due to friction. It will also cause pulley bearing of motor to wear out.

TABLE 1—FULL LOAD WATTS FOR 110/220 VOLT, 60 CYCLE SINGLE PHASE MOTORS

Motor h.p.	Watts	Motor h.p.	Watts
1/6	188	¾	820
1/4	260	1	1,020
1/3	330	1½	1,400
1/2	550	2	1,865
		3	2,800

(h) *Improper assembly.* Any mechanical defect such as assembling parts together wrong. If motor has been into repair shop recently, it may have been assembled wrong or in such a manner that causes certain parts not to function as they should. Motor should be dismantled to determine if this is so. Any mechanical obstruction will prevent governor from releasing, causing motor to get hot very quickly, and brushes will arc and ride on commutator. Trouble should be eliminated step by step. Check fuses first. If three phase, be sure to check all fuses with test light. If the trouble is actually located in motor, always take off motor and either replace with service motor or repair old motor and return.

Do Repairs in Shop

Never try to repair a motor on the job. This is a bad policy as customer always feels that charges are too high for work done. If motor is taken in to the shop it should have a general overhaul besides replacing defective parts. This rebuilds the motor to new motor standards and customer should expect as much service from it as when it was new. An effort should be made to get a rough idea as to what extent motor is damaged so the correct price can be quoted customer. It is essential that the service man should have proper testing equipment to make these preliminary tests. Following are listed some necessary testing equipment for the service man:

1. Capacitor tester.
2. Growler for testing shorted coils.
3. Voltmeter and ammeter.
4. 220 volt test light.

There is some reliable and reasonable testing equipment on the market now. Equipment is your most valuable asset. If you can prove to a doubting customer that certain parts need replacing by using your testing equipment, it will soon pay for itself because it will show up more defects that you might overlook if you had not tested.

Classifications of Motor Repairs

Minor repairs: Solder melted from commutator, worn brushes, brush holder, short circuiting necklace, bearings, spring barrel, motor leads, cracked and short, mounting rubbers rotten, switch parts burned in capacitor motor.

Major repairs: Rewind armature due to being shorted, grounded or bad commutator that needs replacing. Also includes operations listed under minor repairs. If armature has to be rewound, stator must check OK.

Armature is OK. but stator has to be rewound due to shorted or grounded coils. Also includes operations listed under minor repairs.

Rebuild motor completely: Rewind armature and stator. Replace all worn parts and commutator if necessary. Motor should be rebuilt to new factory standards and should last as long as new motor.

If motor needs more than just minor repairs, motor should be exchanged and rebuilt motor installed at once. This calls for only one service call and old motor can be rebuilt for future exchange.

Helpful Hints

Fuse motor as low as possible. Determine running current by testing with ammeter. Fuse with a delayed action fuse such as Fusetron. Try to fuse within 10 percent of running current. If fuse is delayed action type, it will carry starting load OK. and will not blow on start. But if motor runs on starting winding for five minutes, fuse will then blow and prevent motor from burning out. On large type motors from ½ horsepower and larger a thermal protector should be used. They are inexpensive now and sell for about $2.50. If proper attention is paid to protecting the motor, it will never burn out.

When installing a new motor on job, always line up the pulley in the center of flywheel. Never allow motor to run in a cock-eyed position. If allowed to do so it will reap a harvest for the belt companies.

Be careful about connecting line leads to motor leads. Best way is to have terminals or lugs on motor leads and loop line lead around stove bolt through the lug. This avoids job of soldering leads. Always use rubber and friction tape, new not second hand stuff. Replace all broken or burned wire to switch. (Be careful of violating local codes on this kind of work.) Never work on a motor before pulling disconnect switch and then *removing* all fuses in fuse box. If you do not remove them some one may come along and throw in the switch. This happened to the writer once but never again. Don't, oh, please don't monkey around the "business" end of the fan on the pulley while the refrigerator is off cycle; it may start up again at that time. It is always so messy, you know, blood and all.

Watch out for wet or damp places in cellars when working with hot lines. It is the same as standing in the bath tub and touch a light socket.

Changing Direction of Rotation of Motors

Single phase, repulsion-induction type: Motor has clamp for brush holder with set screw on outside of commutator end plate. Loosen set screw and shift brush holder to right or left and set so brushes will kick out at best speed while motor is starting load. Lock set screw.

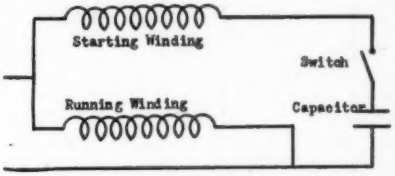


Fig. 2—Wire diagram of condenser start motor.

Split phase motors or capacitor motors: Motor usually has terminal block for line leads. Starting leads and running leads will have to be determined by test light. Only one set such as starting leads will have to be reversed with each other to reverse motor. Usually starting leads are smaller in diameter than running leads.

Condenser hook-ups: Condenser start motors mean just that. The condenser is in the starting circuit only. After the governor switch operates, the condenser is disconnected. The main winding has two leads brought out to a terminal plate. The start-

ing winding has one lead brought out to terminal plate and the other lead is soldered to the governor switch. Another short wire is brought out from the governor switch to one post of the condenser and the other post of the condenser goes to one side of the main winding. Each main winding lead goes to a hot line lead, See Fig. 2.

GROUP 3—ELECTRICAL APPARATUS USED IN A REFRIGERATOR

Electrical apparatus and wiring hook-up on a present-day refrigerator can be quite a complicated achievement. However, the hook-up on a box several years old is about as complicated as a monkey wrench. If one understands the use of the electrical equipment, it cannot be complicated. We know

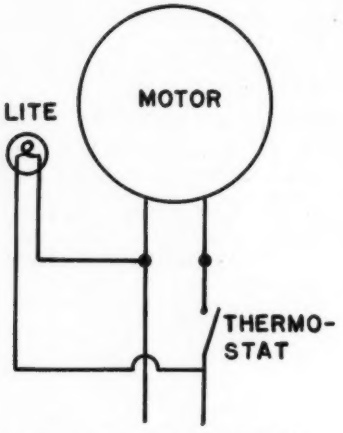


Fig. 3.—Connecting the cabinet light.

the thermostat is nothing more than a bellows actuated by pressure from a bulb moving a set of contact points to open or close the electrical circuit. This means that the contact points open one side of the circuit that goes to the motor.

Almost all hermetically sealed units employ cutout relays to disconnect the starting coils from the circuit after the motor has reached its top speed. The use of the relay seems to work better than a governor switch in a hermetic job. The main principle of the relay is that the motor takes more current to start than it does when it has reached top speed. The relay is designed to work at a certain voltage and current. If less current or voltage is used, the contact points will open. When the motor starts, the heavy surge of current operates the relay until the motor gains enough speed to reduce the current flow through the field coils and also the relay holding coil. This reduction in current through the relay is not enough to hold the strength of the magnetic field up. This in turn releases the armature of the relay and opens the contact points which are in series with the starting coils. This allows the motor to run as a single phase motor.

Sometimes a condenser has a terminal plate built right on it as an integral part. It usually has four terminals or posts. They will be marked as follows: T, TL, L. One post is unmarked. The post marked L and the one unmarked are the condenser terminals. One hot line lead also goes to the ter-

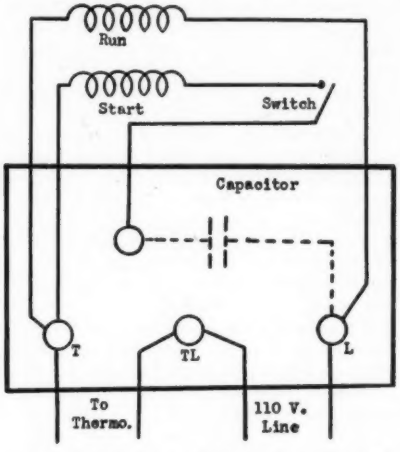


Fig. 4—Making connections to the terminal plate of the capacitor.

minal marked L. The terminals marked T and TL are dead posts as far as the condenser goes and are just convenient places to connect several leads together. The two terminals having a T stamped close to them are for the thermostat and the two terminals with L is used for either line or light leads or both. T stands for Thermostat and L stands for Line or Light leads. See Fig. 4.

If condenser terminal plate has only three posts, it will read T, TL, L, and the unmarked post will be eliminated with connections made internally. If condenser motors need to be reversed, interchange either the two running leads with each other or the two starting leads.

Second Article

High and Low Side Float Systems*

Dealing with the application and operation of the high side float, this article will prove interesting. Its present popularity demands a thorough understanding of its function.

THIS type of liquid control device is commonly called "high side float" because the float ball is located in a chamber subjected to the high pressure or condensing pressure of the system. This discussion covers the operating characteristics and service diagnosis of typical refrigeration systems using the high side float for controlling the flow of high pressure liquid to the evaporator.

A typical high side float is illustrated in Fig. 4. A float ball located in the chamber is attached to the needle valve by means of suitable linkage and fulcrums. The needle valve is actuated toward the seat or closed position of the valve by any downward movement of the ball. Conversely away from the seat or in the open position by any upward movement of the ball.

The construction of all Kelvinator high side floats is vertical. This feature assures that the needle valve and seat will be completely covered with liquid when the ball is at the lowest point of travel and the valve closed. This liquid seal at the valve seat eliminates the erosion of the valve needle and seat, prolongs the life of the valve and eliminates numerous repairs or float exchanges.

Function

The function of the high side float is to regulate the flow of liquid refrigerant from the condenser or high side into the evaporator or low side of the system, thus maintaining a constant level of refrigerant liquid in the float chamber.

By investigating a simple cycle as illustrated in Fig. 6 we find practically all the liquid refrigerant stored in the evaporator or low side. The only liquid stored in the high side is that in the float chamber at sufficient level to permit the needle to close on the seat.

Float Movement

Any movement of the float ball and needle must be accomplished by a change in the liquid level in the float chamber. As the compressor pumps refrigerant vapor into the condenser, the vapor condenses into a liquid and then the liquid flows into the float chamber.

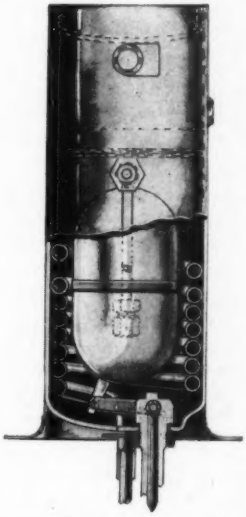


Fig. 4—A typical high side float with a built-in heat exchanger.

When the liquid enters the float chamber and raises the level slightly, the float ball raises with the rise in liquid level and opens the needle valve sufficiently to establish a rate of flow from the chamber into the vaporizing coil equal to the rate of flow from the condenser. The movement of the float therefore, is dependent upon any change in the capacity of the compressor which results

* Courtesy of the Kelvinator Division, Nash-Kelvinator Corp.

in a change in the rate of liquid flow from the condenser into the float chamber.

The capacity of the compressor for a given room or condensing temperature is largely dependent upon the suction pressure in the vaporizing coil or cooling unit. For a fixed amount of surface in the vaporizing coil or cooling unit and a fixed temperature surrounding this surface when the compressor is running, the suction pressure is dependent upon the amount of the surface in the vaporizing coil or cooling unit that is wet with liquid refrigerant.

In a high side float system the amount of surface wet with liquid refrigerant is entirely dependent upon the refrigerant charge. Therefore the maximum travel of the float is at the beginning of the cycle, and then only when the vaporizing coil is fully charged with refrigerant with its resulting maximum suction pressure for a given cabinet temperature.

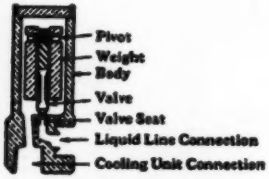
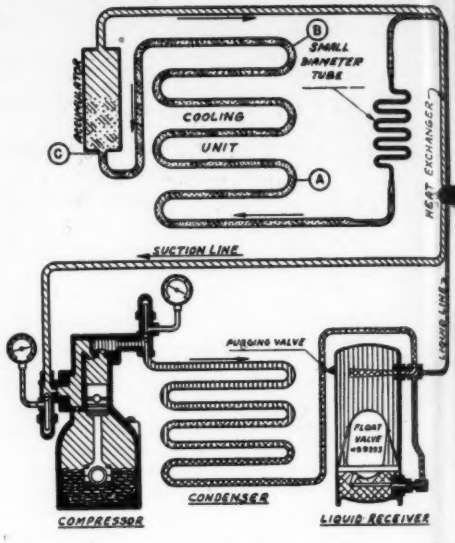


Fig. 5—Liquid temperature valve.

The refrigerant charge therefore is the predominating factor in obtaining normal movement and operation of the float.

Application

High side float liquid control is used on certain models of Kelvinator household, ice cream cabinet, beverage cooler, water cooler and room cooler self contained unit systems. Analysis of the refrigerant cycle indicates that the high side float application should be used only on a single evaporator connected to its individual condensing unit. Multiple evaporators or parallel evaporators cannot be successfully fed with high side float control. On some large commercial installations, one float can be used to feed two or more continuous pass evaporators in series. The service difficulties encountered due to sudden load changes on evaporators in series, offsets any advantage obtained. Therefore, its use has practically been discontinued except in special cases of unit systems where the evaporators in series are fed by a single float, and the condensing unit can be accurately powered for the maximum load imposed on each evaporator in series.



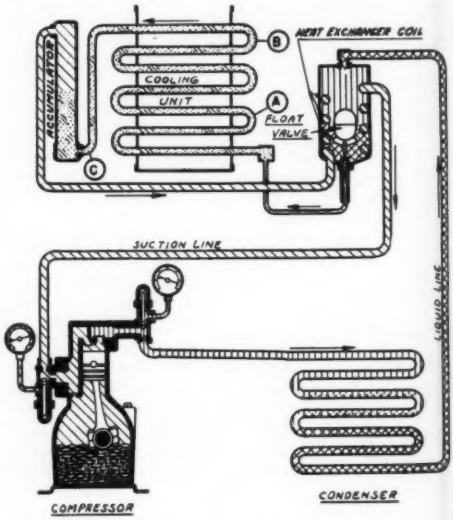
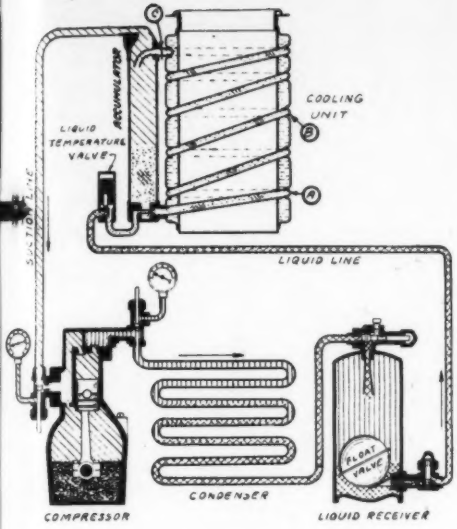


Fig. 6—(Top) Kelvinator water coolers and beverage coolers using a small diameter tube in the liquid line to maintain pressure and prevent frosting on the liquid line.

Fig. 7—(Below) Ice cream cabinets employing the heat exchanger float valve.



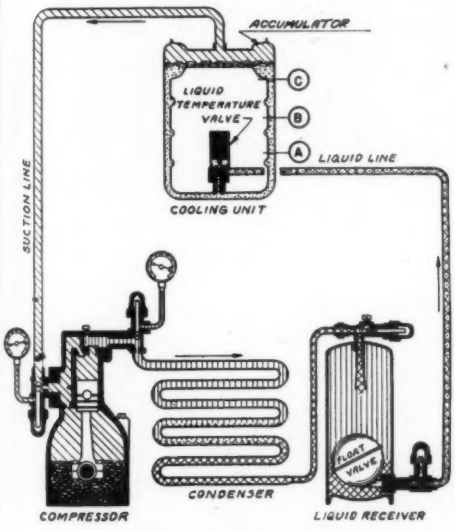


Fig. 8—(Top) Kelvinator Ice Cream cabinet using the liquid temperature valve in the liquid line. No heat exchanger is used.

Fig. 9—(Below) Household refrigerator using the liquid temperature valve mounted at the back of the evaporator.

Air Cooled Systems

Referring to the refrigerant cycles, Figs. 6 to 11, the volume of refrigerant to flood or wet all the surface of the evaporator must be greater than the volume of the condenser tubing. The combined volume of the space above the liquid in the float chamber and the condenser tubes can be greater than the evaporator. This usually is the case in the majority of systems so that the high side will hold the entire refrigerant charge.

If the evaporator volume is smaller than the condenser tube volume alone, at light loads and cool condenser air passing over the condenser, the condenser tubes may hold all of the refrigerant liquid. Should this happen no liquid could drain into the float chamber to float the ball and effect a return to the evaporator. On the other hand if the evaporator volume is greater than the condenser tube, as the condenser tube fills with liquid there will be sufficient liquid left in the evaporator so that the compressor will heat the condenser and force the liquid to drain into the float chamber.

On systems with a correctly balanced evaporator volume and condenser tube volume, an inadequate refrigerant charge can permit all the refrigerant liquid to stay in the condensing tubes, thus giving the symptoms of a stuck shut float or frozen feed line. Again we wish to emphasize the necessity of the correct refrigerant charge on high side float systems.

Water Cooled Systems

A typical high side float system using a water cooled condenser with a detached high side float is illustrated in Fig. 12. In this type system, the condenser volume is of necessity larger than the low side volume. For this type system to operate successfully the float chamber must always be at a lower temperature (and pressure) than that in the condenser shell. The pressure difference necessary between that in the condenser and the float chamber, will depend upon the liquid head to drain the condenser into the float and the friction head in the tube connecting the outlet of the condenser into the float chamber.

A study of the water circuit in Fig. 12 will reveal how this pressure difference is accomplished. The cooling water enters a water jacket surrounding the float. The temperature of the liquid in the float chamber and its resulting pressure, corresponds to the temperature of the inlet water. The water leaves the float chamber and then en-

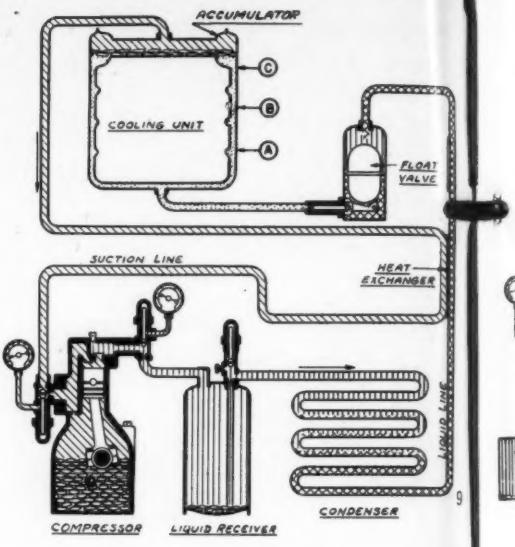
ters the water cooled cylinder head. At this point the water picks up heat from the cylinder head, therefore there is a rise in water temperature leaving the cylinder head. From the cylinder head the water enters the condenser coil when it picks up the latent heat of condensation and superheat from the vapor in the condenser. There is a further rise of 15 degrees to 20 degrees in water temperature through the condenser. Under normal operation there is therefore always a temperature difference between the float chamber and the condenser chamber, the pressure difference is proportional to this temperature difference. This resulting pressure difference permits the condenser chamber to drain into the float chamber as fast as the liquid condenses, thus establishing a rate of flow from the float to the evaporator equal to that delivered to the condenser by the compressor.

Another type water cooled system using a high side float is illustrated under Fig. 13. This type is used on certain Kelvinator water cooled self contained room coolers. Following the water circuit, the water enters a water coil located in the liquid in the float chamber. The coil is extended to the top section of the enlarged part of the float chamber which forms the condenser proper. It is very evident that any vapor that condenses in the top section will fall down to the bottom and open the float. The liquid surrounding the float is sub-cooled by the entering water passing through the coil submerged in the liquid.

Floats with Heat Exchangers

Tests prove that the use of heat exchangers on systems using Freon-12 are essential for efficient operation of the system. On a simple high side float system, the refrigerant liquid passing through the float valve, immediately changes pressure and temperature equal to that of the evaporator and essentially the feed line from the float to the evaporator becomes part of the low side. This characteristic of a simple system prevents the exchange of heat between the warm liquid and the cooler suction gas. To obtain the benefit of sub-cooling the liquid by this exchange of heat, two methods are used on Kelvinator high side float systems and are illustrated in Figs. 6, 7 and 10.

The construction of the systems illustrated in Figs. 6 and 10, permits the exchange of heat from the liquid line to the suction line, by soldering the suction and liquid line together and placing a small diameter tube in the liquid line at the evaporator inlet. This



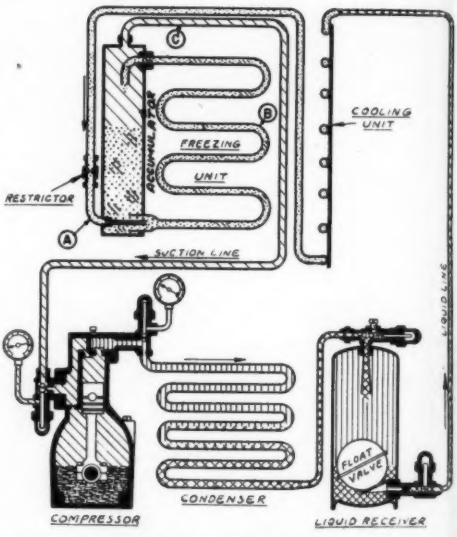
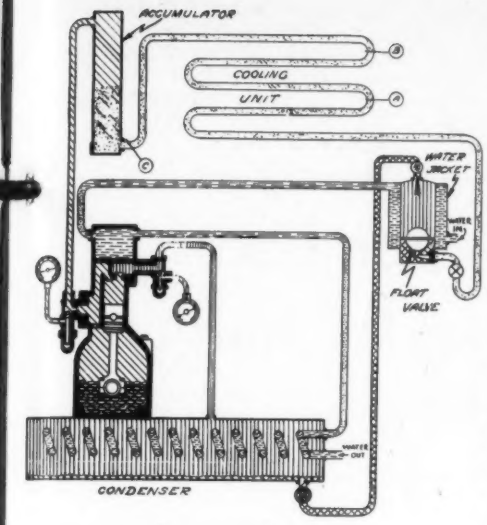


Fig. 10—(Top) Kelvinator household unit with the float mounted on the back of the box near the top. A receiver between the compressor and condenser permits the entire charge to be pumped down and held at this point.

Fig. 11—(Below) Household refrigerator with two different sections in the evaporator. A restrictor is used between the two sections.



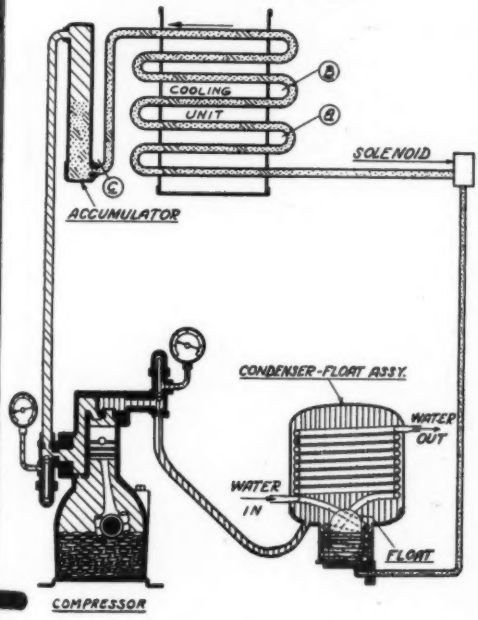


Fig. 12—(Top) Kelvinator room cooler using a water cooled condenser and water cooled high side float.

Fig. 13—(Below) Room Cooler with a water cooled condenser float assembly.

small tube throttles the liquid flow from the float to the evaporator, thereby keeping the pressure and temperature in the liquid line much higher than the suction gas temperature. The heat will then flow from the warmer liquid to the cooler suction gas. This type construction is advisable on brine, sweet water baths or any type system where the pull-down is very long. By proper design the suction pressure can be limited on the pull-down to prevent continued overload on the motor. It is used on certain water coolers and beverage coolers. With the system illustrated in Fig. 7, the heat exchanger is built into the bottom of the float chamber where it is submerged in the liquid surrounding the float ball. The exchange of heat is from the warm liquid in the bottom of the float chamber to the cool suction gas passing through the coil. On this type of system the connecting tube between the float outlet and the evaporator is a part of the low side and must be insulated on application for a temperature below 32 degrees F. The insulation on the tube must be sealed thoroughly to prevent ice from destroying the insulation. This type of system is especially suited for self-contained units where the outlet of the float is reasonably close to the evaporator inlet. It is used on certain types of ice cream cabinets and household refrigerators.

On certain sulphur dioxide systems only, a heat exchanger effect is accomplished as illustrated in Fig. 10. The super-heated vapor leaving the compressor, enters directly into a receiver where most of the superheat is removed from the vapor. The near-saturated vapor enters the condenser tubes where condensation occurs. The liquid leaving the condenser tubes passes through the liquid line to a small volume float chamber. The liquid line is soldered to the suction line to sub-cool the liquid before it enters the small volume float chamber. The receiver location ahead of the condenser functions to remove the superheat from the vapor, acts as a receiver to hold the complete charge should stoppage occur from the float and permits pressure flow of the liquid to the float chamber.

Floats with Liquid Temperature Valve

On some earlier household refrigerators and on beverage coolers, a simple high side float system furnished the liquid control. To eliminate the frosting or the necessity of heavy insulation on the connecting tube between the float and evaporator, a liquid temperature valve is installed in the liquid line directly at the evaporator inlet. Typical

cycle charts are illustrated in Figs. 8 and 9. Exterior and interior of the liquid temperature valve is illustrated under Fig. 5. The purpose of the valve is to maintain pressure on the liquid line.

On sulphur dioxide systems the weight of the valve is such that a pressure difference of 25 lbs. gauge is maintained between the liquid line and the evaporator. On ice cream cabinets with a methyl chloride system it maintains 80 lbs. pressure difference between liquid line and evaporator pressures.

(To be Continued)

The Bomb Method of Evacuating and Charging

By G. S. McCLOY and A. W. HALEY*

THE bomb method of evacuation and charging has been used on many thousands of our domestic refrigerating units and has given entirely satisfactory results. It consists, briefly, of precharging a container with refrigerant, attaching the container to the unit, draining the refrigerant into the unit, collecting noncondensable gases from the unit in the container, and, finally, pinching off and removing the container.

It has long been recognized that satisfactory performance of the unit is dependent on a minimum content of non-condensable gas. In the past, satisfactory non-condensable content was obtained with our float valve type of unit by evacuating the system with a vacuum pump previous to charging, then charging with oil and refrigerant through connections to a charging stand, and purging the remaining non-condensables from a vent in the high side float chamber after a period of operation of the unit. Although satisfactory results were obtained by this method, there were certain undesirable features, namely:

1. It required a vent valve in the high side.
2. It was not adaptable to the conveyor system.
3. It distributed responsibility of proper processing over a large group of operators.
4. A large number of vacuum pumps was required.
5. The charging stands required many valves and connections. Upkeep was high, and there was always the possibility of leaks or improper operation by the workmen.
6. Considerable skill and judgment by the operator was required to avoid uncertainty of final non-condensable and refrigerant content.
7. The time required for the evacuating and charging was excessive.
8. There was danger of undercharging the unit by purging refrigerant with the non-condensables.
9. The temperature of the refrigerant had to be kept within narrow limits, and had to be above the temperature of the unit.
10. The connection to the unit had to be heated after charging.

In addition, it was found that our low volume high side capillary tube unit required a definite minimum of non-condensables. This could not be obtained by the vacuum pump and purge method because of the inability to purge satisfactorily the non-condensables that were slowly evolved from the winding no matter how good the initial vacuum. Our search for a better method of evacuation resulted in the development of the bomb method of evacuation and charging.

There are three important sources of non-condensable gases:

1. The original air left in the unit after dehydration and not removed by evacuation. In a unit of the hermetic type

*Westinghouse Electric and Mfg. Co., Springfield, Mass. Paper presented before the Joint Meeting of the A.R.S.E. and R.S.E.S. Chicago, January 17, 1940.

the cotton insulation of the winding supplies a myriad of small crevices from which the removal of the entrained air is very difficult.

2. Non-condensables dissolved in the lubricating oil.
3. Non-condensables dissolved in the refrigerant.

These non-condensable gases in the system impair the performance of the unit because they reduce the effectiveness of the condenser, and raise the operating discharge pressure above that due to the refrigerant vapor pressure alone by adding the pressure of the non-condensable gases. In addition they cause increased oxidation of the oil, especially at the valves due to the presence of oxygen at high temperatures, also a higher torque motor is required for pull down at the higher discharge pressures.

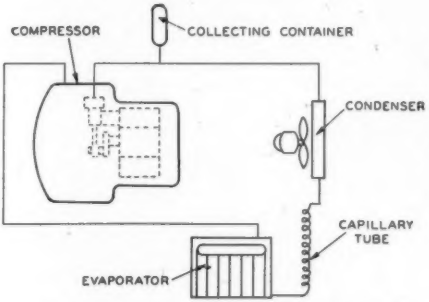


Fig. 1—Diagram of refrigerating unit showing application of bomb container.

Fig. 1 is a line diagram of our type of capillary tube refrigerating unit. As the unit is designed, when operating with the condenser and evaporator exposed to certain ambient conditions, there will not be a positive liquid seal over the entrance of the capillary tube, consequently the tube will pass a mixture of gas and liquid or gas alone. Since the direction of flow in the condenser is toward the capillary tube, the non-condensable gas concentration is highest at the condenser outlet. Therefore, if the end of the capillary tube is periodically uncovered a certain amount of non-condensable gases will pass through it and be circulated through the system.

In the tube connecting the compressor to the condenser, the refrigerant is in the vapor phase. Flowing through this tube is a mixture of the refrigerant vapor and the non-condensable gases. If a container is connected in this line as shown in Fig. 1 the mixture of the two gases will enter it. The refrigerant vapor part of the mixture will condense on the walls of the container and drain by gravity from it, leaving the non-condensable gas in the container. As the refrigerant condenses and drains out, more of the gas mixture flows into the container. Thus, there is a constant flow of refrigerant and non-condensable gas mixture into the container and a draining out of the liquid refrigerant.

If the unit is operated long enough, practically all of the non-condensable gases will be collected in the container. This container then will have in it a mixture of refrigerant vapor and non-condensable gases. The quantity of each will be the result of the physical and operating conditions.

Problem of Gases

If there were no non-condensable gases in the system then the container would be filled with refrigerant vapor at the condensing temperature and discharge pressure plus the liquid refrigerant flowing down the sides of the container. Neglecting the last named quantity we could approximately calculate the amount of refrigerant vapor from the following expression:

$$M = Vd \qquad (1)$$

where M = Weight of refrigerant, pounds, V = volume of container, cubic feet, and d = density of saturated vapor at condensing pressure, pounds per cubic foot.

Assume, however, that there are non-condensable gases in the unit and that they are collecting in the container. The normal movement of the refrigerant vapor-non-condensable gas mixture is upward, which results in a concentration of non-condensable gases at the top of the container. The total pressure in the container cannot be greater than the discharge pressure. Therefore, within the container there is a difference in refrigerant vapor pressure, the lowest pressure being at the top where the non-condensable gas concentration is highest. As the non-condensable gas concentration increases, the refrigerant vapor pressure is reduced until condensation ceases, and if sufficient non-condensable gas is present, this condition will prevail throughout the entire container. This low limit of the refrigerant vapor pressure is determined by the temperature of the container. The thermal conductivity of the connecting tube is low enough so that we can assume that the

temperature of the container will stabilize at room condition. Thus, in the container under these conditions, there is a total pressure equal to the discharge pressure. This total pressure is the sum of the refrigerant vapor pressure plus the non-condensable gas pressure. The refrigerant vapor pressure is that corresponding to the room temperature, therefore the non-condensable gas pressure is the difference between this refrigerant pressure and the discharge pressure.

The quantity of non-condensable gas which is the maximum possible under the above condition could be approximately calculated from the expression:

$$(P_1 - P_2)\ V = MBT \qquad (2)$$

where P_1 = Discharge pressure of unit, pounds per square foot absolute, P_2 = refrigerant vapor pressure at room temperature, pounds per square foot absolute, V = volume of container, cubic feet, M = weight of non-condensable gas, pounds, B = gas constant, and T = temperature of container, degrees F. absolute.

The quantity of refrigerant vapor which would be the minimum possible retained by the container under those conditions can be obtained from equation (1). In this case, however, the value of the density is that for the saturated vapor at room conditions.

Auto-Evacuation Used

After these gases have been collected, the container can be closed off from the rest of the system and removed by pinching and sealing the connecting tube. It is desirable to keep the size of the container as small as possible to minimize the quantity of refrigerant removed from the unit when the container is detached. To accomplish this we use a method called auto-evacuation. By this method, before the unit is charged, we operate the compressor to evacuate the low side of the unit partially and discharge this evacuated air to the atmosphere. This reduces the amount of non-condensable gases to be collected in the container. In our unit the largest volume, by far, is that on the low side, so this method is very effective.

By using the same container used for collection of non-condensable gases and accurately charging it with refrigerant before attaching to the unit, we provided a simple and accurate way of charging the unit with refrigerant. This limits the minimum size of the container to that required to hold the refrigerant charge safely.

This container shown in Fig. 3 is of a cylindrical shape about 30 cubic inches in volume, made of a copper alloy. It is provided with a rupture disc in the top. Below the container is a sight glass, then a diaphragm valve with a Micarta seat. The connector below the valve is of stainless steel and is threaded to fit a flare nut.

Because of the shape of this container it soon became commonly known as a bomb and the process as the bomb method of evacuation and charging.

Application to Units

The bomb connection may be made at any point along the high side tube from the compressor shell to the condenser. In our unit, the bomb connecting tube is welded to a connector where the discharge tube leaves the compressor shell. The connection is so made as not to obstruct the discharge gas flowing from the pump to the condenser. The bomb connecting tube, of 5/16-inch diameter copper tubing, rises vertically from this connector and has a flared connection for attaching the bomb.

After dehydration, the units are removed from the ovens and hung on a chain conveyor that takes them through the various steps of the evacuation and charging process as described below. Spring bronze collectors are so arranged on each conveyor hook that at various steps in the process they make contact with a pair of electrified rails, and supply power for operating the unit.

The units first pass an oil charging machine, Fig. 2, that accurately meters and forces, under pressure, the correct charge of oil into each compressor shell. The bomb connecting tube is open, during this operation, in order to relieve the pressure in the shell, and thus prevent blow back of the oil through the charging tube when the charging hose is removed. After charging, the oil tube is pinched shut and sealed.

After a few minutes on the conveyor to allow the oil to find its proper level in the shell so the oiling system will function properly, the unit reaches an electrified section of the conveyor. At this point an auxiliary starting relay is connected, to allow operation of the compressor.

The compressor automatically starts when the unit reaches the power rail, serving as its own vacuum pump to pump the air from the low side out through the open bomb connecting tube. The low side vacuum produced by this method is limited, of course, because the high side cannot be reduced be-

low atmospheric pressure, and there is a constant leakage of air from the high side into the low side through the capillary tube. Any interruption of the power during this step of the process would result in an incomplete evacuation. If the pump valves are not seating properly or if there is an internal leak, the air will not be properly evacuated. This will usually be detected by a pulsation at the end of the bomb tube. A five-minute period of operation is sufficient for this part of the process. At the conclusion of this time, but before the unit leaves the power rail and stops, the bomb, which has previously been accurately charged with Freon-12 refrigerant by the charging machine, is attached to the bomb tube and the flare nut tightened.

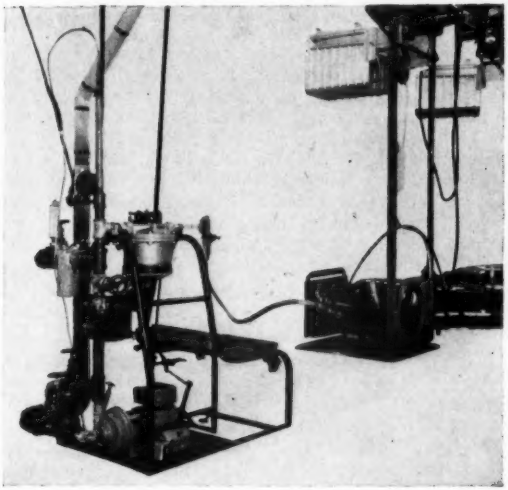


Fig. 2—(Above) Oil charging apparatus.

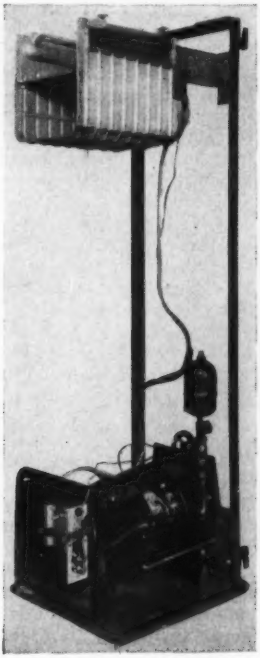


Fig. 3—(Right) Refrigerating unit with bomb attached.

After the unit leaves the power rails, the auxiliary relay is disconnected. The bomb valve is opened, and the refrigerant charge starts to drain into the unit. The path of the entering refrigerant is through the condenser, through the capillary tube, and into the evaporator. In our unit it takes about a minute before the evaporator liquid line becomes cold due to expansion of the refrigerant as it leaves the capillary tube. This provides a test for possible restriction or clogged joints between the bomb and the evaporator.

The next step is the total immersion of the unit, still on the chain conveyor, in a heated water bath for detection of leaks. Following this leak test, all parts that would have been damaged by the water immersion are assembled to the unit, and the unit, shown in Fig. 3, is ready for the final step of the process, air collection.

Collection of non-condensables in the bomb is accomplished by operating the unit from power rails. Experimentally it was determined that proper collection of non-condensables was possible under a wide range of conditions, but the length of time and the degree of collection varied with these conditions. Because of variations in temperature and humidity in the assembly section of the factory, resulting in improper processing, it was decided to collect non-condensables in the same air conditioned room used for final test of the units. This room is kept at 86 degrees F. and 47 per cent relative humidity within very narrow limits, which re-

sults in a constant load on the units and constant head pressure the year around.

It was ascertained that a period of thirty minutes on the chain conveyor under these conditions allowed a safe margin for proper air collection in our particular unit.

Operation of the unit during this part of the process must be continuous because if the unit stops the bomb contents will re-enter the unit. It is possible to detect, by inspection, a unit that has not run continuously. When the unit starts the run, the evaporator is dry. It rapidly collects an even coating of frost. If the unit stops running, it cannot start again immediately as the pressures in the high and low sides must equalize through the capillary tube, and the unit remains off long enough to defrost. Although the unit may restart and run long enough, after this, to collect a good coat of frost again, a careful inspection will detect the drops of water frozen to the evaporator, indicating that the unit has not run continuously. After air collection is complete and the bomb valve is closed the unit may be stopped, but in order to avoid the hazard of leaking bomb valves the unit is allowed to continue running until after the bomb is pinched off. Any unit that does not run continuously for the required time period is not pinched off, but has to repeat the process run.

How It Appears in Sight Glass

It is possible to watch the process that results in the collection of non-condensables through the sight glass in the connection tube of the bomb. As the unit starts and the pump begins to force refrigerant into the condenser, we can see the liquid refrigerant appear in the tube behind the sight glass. The liquid level rises rapidly until the tube is full, indicating that the bomb itself is partly filled with liquid. There is considerable agitation, and bubbles arise through the liquid continuously. The sight glass remains full, indicating that the mixture of gas and non-condensables is still entering the bomb faster than the condensed refrigerant can drain out. The temperature of the entire surface of the bomb is approximately the same as the temperature of the condenser. As the air collection continues, the level of liquid refrigerant in the sight glass begins to drop, and soon disappears from sight, indicating that the refrigerant is draining faster than it condenses on the sides of the bomb. A thin trickle of liquid can still be seen on the walls of the tube behind the glass showing that action has not entirely stopped. The top of the bomb becomes cooler indicating collection of non-condensables, and as the collection continues the bomb becomes progressively cooler.

At the end of this collection period the unit reaches the pinch-off station. An inspector examines the condition of frost on the evaporator, and looks through the bomb sight glass, to be sure the bomb tube is not filled with liquid. If the frost condition is satisfactory, and if there is no liquid behind the sight glass the inspector closes the bomb valve. The unit, still running, passes the pinch-off station where the bomb connector tube is pinched off and sealed close to the compressor shell. Any escape of Freon-12 refrigerant from an imperfect seal is indicated by the characteristic color in the flame of the welder's torch, but in addition a final test for leaks is made before the unit leaves the test room. The unit continues through the same air conditioned room for its performance test while the bomb is returned to the bomb charging machine for recharging.

(To be Continued)

Sealing Air Conditioned or Refrigerated Rooms

A VERY successful glazing or sealing material for all installations where temperature and humidity must be strictly regulated is Plastikon Rubber Putty.

Plastikon maintains an effective waterproof seal indefinitely and retains a degree of plasticity permanently. It never hardens, dries out, or cracks, and therefore, maintains an air-tight seal. It adheres strongly to wood, steel and glass, and is resistant to corrosive effect of chemicals, fumes and salt spray. Vibration does not affect it.

There are many uses for this material in refrigeration and air conditioning work. It may be purchased from The B. F. Goodrich Company, Akron, Ohio.

Frank Keenan
Pennsylvania

Your magazine has been an invaluable aid to me, and I feel it is vitally necessary to every "up and doing" service man who is interested in keeping up to date. That can be done through reading and studying the very interesting articles in your magazine.

Refrigeration System of Liquid Carbonic Soda Fountains

By JOHN G. PRAETZ*

INDICATIVE of the increasing interest being displayed by service men throughout the country in the subject of modern soda fountain refrigeration is the importance attached to discussions on this topic at the scores of service meetings sponsored in key cities since the first of the year by The Liquid Carbonic Corporation. To give service men and others a few general suggestions, the following is presented:

"Lifetime" Soda Fountains

The Liquid "Lifetime" soda fountain has the stub type of hold-over tank built into the ice cream section. This provides a lateral temperature variation resulting in a low temperature brick compartment while the bulk storage holes increase slightly in temperature extending away from the ice cream section evaporator, the warmest hole being furthest from the evaporator.

Fig. 1 shows a cutaway view of the 1939 "Lifetime" fountain. Only three refrigerant controls are required in the refrigeration system, a low side float valve in the ice cream flooded evaporator, a thermostatic expansion valve in the syrup rail-water cooling sections and a thermostatic regulating valve to control the amount of ice formation in this section.

There have been only two changes in the system since it was introduced. These were made early in 1939 and are being carried through into 1940. The thermostatic expansion valve, TEV-21, was changed to a TEV-18 which has a smaller orifice and resulted in maintaining a better flooded condition of the water cooling evaporators with less tendency to frost back or sweat on the suction line. A check valve was added to the suction line from the ice cream section evaporator to prevent condensation in the ice cream evaporator of the warmer refrigerant vapor from the water cooling section while at the same time making the system more responsive to water load conditions by causing any increase in back pressure due to water load to be transferred to the low pressure control, cutting-in the condensing unit sooner than with the earlier system. The result of both of these changes has been a decrease in total running time per 24 hours, with a consequent lower operating cost for the fountain and improved operating characteristics.

Two electrical switches control the fountain temperatures. A thermostatic switch supplied with the fountain is used to control the ice cream temperature while a low pressure control switch is set to operate on the water bath section or salad unit if connected to the same condensing unit. The thermostatic switch results in positive control of the ice cream section temperature independent of the water load conditions and low pressure switch cut-in settings. The thermostatic switch supplied with the fountain is a Frigidaire 1122047 control.

A small duct in front of the ice cream evaporator makes it possible to locate the thermostatic switch in the basement near the compressor and simplify connections to this switch. By drilling a small hole in the floor in line with the duct, the capillary bulb can be slipped up through the floor and duct and inserted in the well in the ice cream evaporator.

Installation

Due to the low refrigerating effect and latent heat per pound of Freon (F-12), compared to sulphur dioxide it is necessary to circulate almost three times as much Freon as was necessary with sulphur dioxide and consequently larger lines on both liquid and suction must be used. Small lines will result in higher head pressures and lower back pressures at the compressor decreasing the condensing unit capacity and causing longer running time with higher power consumption. Liquid lines from the condensing unit to the fountain should not be smaller than $\frac{3}{8}$ inch while suction lines should be $\frac{5}{8}$ inch. Where large condensing units are used on multi-

*General Service Manager, Soda Fountain Div., Liquid Carbonic Corp.

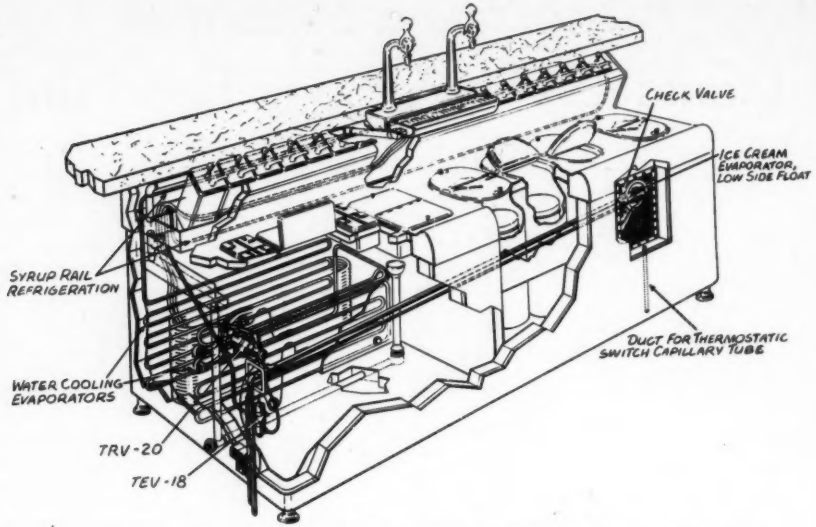


Fig. 1—Cutaway view of Liquid "Lifetime" Soda Fountain showing 1939 refrigeration system.

plexed installations, the refrigerated equipment should be manifolded near the condensing unit with double or larger suction lines run from the manifold to the condensing unit. A dryer should be installed in the liquid line and permitted to remain about 10 days.

A liquid line sight glass should be installed and left permanently in the liquid line to enable the service man to check for refrigerant shortage. This sight glass will pay for itself many times over in decreased time required for service. Probably the commonest trouble with F-12 systems is shortage of gas, and unless a means of readily determining gas shortage is provided, the service man will be groping in the dark in trying to locate the difficulty. The checking of proper refrigerant charge on F-12 systems through head and suction pressures alone is almost impossible due to so many conditions affecting the gauge readings.

The two electrical condensing unit switches should be connected in a parallel arrangement with the overload heating elements connected in series. Each switch should be able to start and stop the condensing unit independently of the other. The electrical connections are shown in Fig. 2. The overload elements are connected in series to insure that both switches will be cut out in case of an electrical overload on the motor. It will be necessary to install the proper size overload elements in the switches at the time of installation, the size depending on the horsepower of the condensing unit motor. Many of the newer condensing unit motors are being supplied with overload protection built into the motor itself, in which case the overload heating elements can be left out of both switches and jumpers connected across the overload terminals or the connection made direct to the contact terminal. In all cases the hot wire of the electrical supply circuit should be connected to the switch first, the current then passing through the contacts to the motor and out to the ground side of the line so that the motor windings are dead when the switch contacts are open. The high pressure cutout on the thermostatic switch must be connected into the high pressure connection on the low pressure switch so that both switches will be cut out in case of an excessive head pressure. The factory setting on the thermostatic switch is zero degrees cut-out and plus four degrees cut-in.

Adjusting Procedure

Fig. 3 shows the "Lifetime" fountain refrigeration system. A simple method of obtaining adjustments in a minimum of time is outlined in the following:

It is most important that the proper amount of oil is added along with the re-

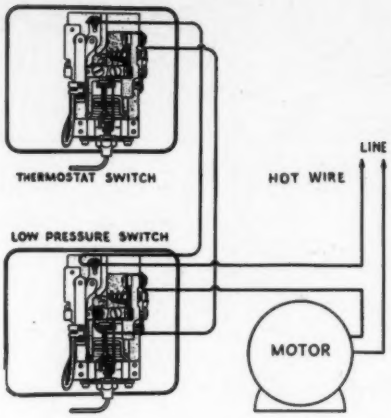


Fig. 2—Switches connected in parallel and heater elements wired in series.

frigerant at the time of installation because if the service man neglects to do this, the oil which circulates with the refrigerant will be taken from the compressor leaving it short on oil, resulting in compressor or seal trouble.

There are two reasons why it is recommended that the ice cream evaporator valves be left closed until the ice formation has been obtained in the water bath section. The first is to have the entire compressor capacity available to pull down the water bath section and form ice rapidly thereby obtaining these adjustments in the shortest time. The second reason is that cooling the water bath down to low temperature insures the thermostatic charge in the capillary tube element of the TRV-20 control remaining condensed in the bulb. If the charge condenses in the bellows at the valve due to this latter becoming colder than the bulb, the valve will close off and become erratic in operation. There is a tendency in Freon systems to frost back during the long first pull down period. This may frost up the TRV control and would tend to cause the thermostatic charge in the capillary system to transfer to the bellows which would then become the control point. If the charge does become transferred, merely warm up the TRV bellow by placing a warm hand or warm cloth around the bellow of the valve to drive the charge back to the bulb in the water bath. The bulb on all vapor-charged elements must always be located at a colder point than the bellows so that the bulb remains the control point for the valve.

The low pressure switch should be ad-

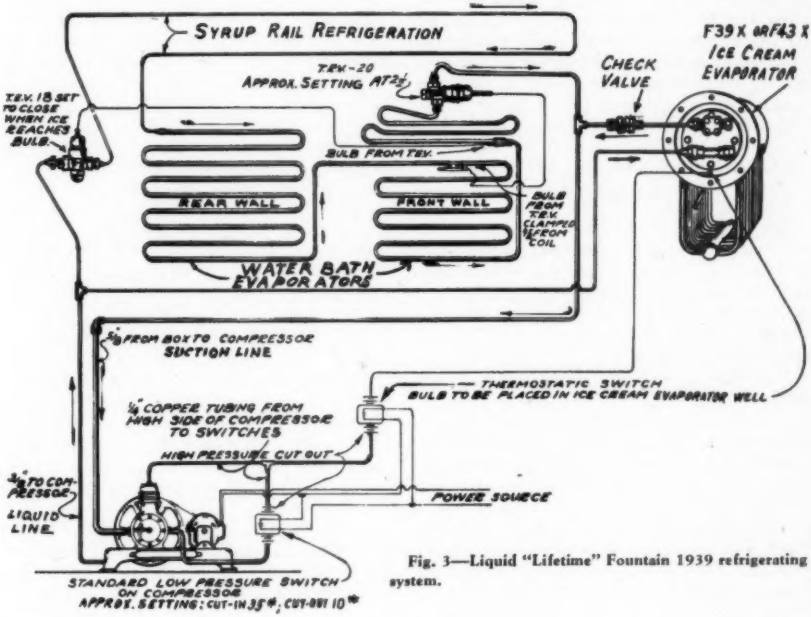


Fig. 3—Liquid "Lifetime" Fountain 1939 refrigerating system.

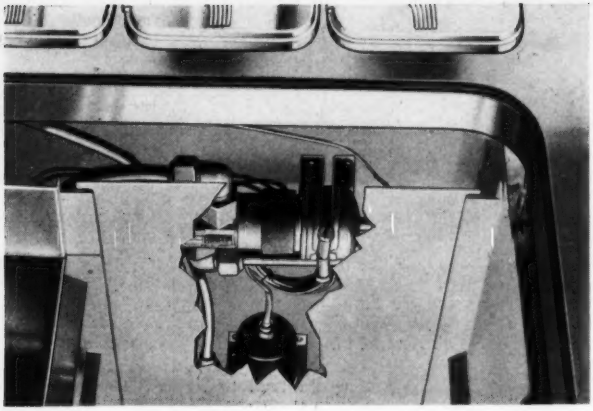


Fig. 4—The TEV and TRV controls are located in the dry storage compartment for accessibility and ease of adjustment.

justed to cut-in at 35 lbs. and to cut-out at 8 to 10 lbs.

A shortage of refrigerant in the "Lifetime" refrigerating system will show up first in the syrup rail-water cooling section. It will be impossible to properly adjust and control the ice formation if the system is short of refrigerant. The low side float will keep the ice cream evaporator full of refrigerant leaving the rest of the charge for the syrup and water cooling sections. If the system is short of refrigerant, little or no ice can be obtained on the front water bath evaporator due to the refrigerant being completely evaporated in the syrup rail and rear water bath evaporators, even with the TEV adjustment wide open.

Troubles Indicated by Ice Formation on the Syrup Rail

Excessive ice formation in the syrup rail and on the rear water bath evaporator with little or no ice on the front evaporator indicates either (1) a shortage of refrigerant charge, (2) the expansion valve not open ("raise") wide enough, (3) or the TRV-20 not set cold enough.

The TEV controls the amount of refrigerant admitted to the evaporator coils while the TRV controls the amount of ice formed in the water cooling section. Generally at position No. 2 on the TRV little or no ice will form on the front evaporator while at No. 3 it may freeze solid.

The approximate adjustment of the TRV-20 on salad units will be about No. 2 varying between No. 1 and 3 depending on size and load conditions.

Fig. 4 shows the convenient and accessible location of the TEV and TRV controls in a separate compartment in the dry storage section of the soda fountain.

In the August issue the author will describe the "Simplex" and "Red Diamond" Fountains.

NOW IT'S THE COLD DOG STAND

WHAT promises to be one of the most popular features of the 1940 World's Fair, believe it or not, resulted from a woman's ramblings about the fair grounds last August.

It's the "Cold Dog Stand," or foot cooler, a new attraction at the Carrier Igloo, where walk-weary fairgoers will be able to air condition and soothe their burning bunions in between tramps from the Trylon and Perisphere to Brazil, France, Poland and the nearest exit.

One of the failings of last year's exposition, critics agree, was lack of the "woman's touch." First impression was of massive structures, gigantic statues and wide open spaces in between.

Margaret Ingels, only woman air conditioning engineer at the Syracuse plant of the Carrier Corp., came to New York on one of the hottest days last August and started out to see the Fair. After several hours, she dragged her tired feet into the Carrier exhibit.

"I don't think anything has ever looked or felt quite so good to me as that chair I flopped into," she smiled today. "My feet were burning like hot coals. The idea hit me

then. Why not 'air condition' the hot 'dogs' at the Fair next year."

Back in Syracuse, she started putting her ideas on paper. Several rough sketches she had made fell into the hands of J. I. Lyle, president of Carrier.

As a result, the elaborate "throne," which will hold three persons at a time, was planned, Judging from last year's foot troubles, this "Citadel to Foot Comfort" at the Carrier exhibit should do a land-office business.

SERVICE KINKS

Tools and Equipment You Can Build

Under this heading will appear simplified or short cut methods of performing individual service operations; also details of how you can build special tools and equipment for your own use. Readers are invited to submit information for publication under this head.

A Simple Burglar Alarm

By AN R.S.E.S. MEMBER

OUR burglar alarm system is not an approved system. By that I mean it's design is one which does not meet the approval of the Underwriters Laboratory. The reason we used it, however, is because of its extreme simplicity. The average refrigeration service man does not carry enough stock to warrant a great expenditure of money. This alarm system can be made entirely of parts found around the average shop. An old oil paper condenser can be unwound and cut into strips ½ or ¾ inches wide. These strips are carefully shellacked to the doors and windows so that if a glass is cracked or a panel split out of a door it will break the tinfoil and open the circuit. On the doors and windows that must be opened, contact switches may be made of sheet copper and bronze weld rod as shown in Fig. 1. The bronze rod has enough spring so that it will make firm contact even though the wind rattles the door. After all the windows, doors and walls, that a thief would be likely to cut through, have been taped with strips of foil, the foil circuits are connected in series and one end of the series is grounded. The other end is connected to the panel board which may be placed anywhere. In our case we secured permission from our neighbors to run a line across the back lots to my home a block away. A single wire is all that is necessary, but we ran four wires. One for the alarm, two for a private telephone and the fourth controls a relay which lights our yard lights so we do not have to enter any dark area where a prowler might lurk.

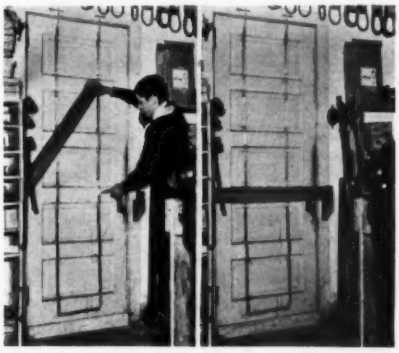


Fig. 1—Showing the method of wiring the door. At the left the switch and contacts are shown in the open position. At the right after the bar is placed in position the switch is closed.

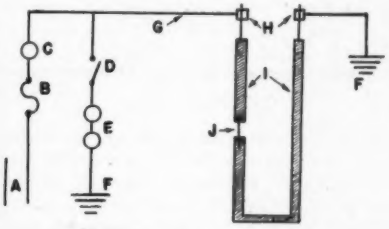


Fig. 2—Wiring diagram of Burglar alarm.

A—115 volt line.
B—½ amp. fuse.
C—Sign lamp.
D—Single pole switch.
E—Phone bells.
F—Ground connection.
G—Line to shop.
H—Spring contacts.
I—Tinfoil on doors and windows.
J—Contact switch.

The panel consists of a fuse block, socket, single pole knife switch, and a set of straight line bells that you can secure at the local telephone company if you know the right fellow. The reason for using a set of telephone bells is, they have no contacts to get

out of order and they will ring on a 115 volt 60 cycle circuit. You will note in the diagram, Fig. 2, the circuit travels from the hot side of the line through a ½ ampere fuse. (Get this from the telephone co.) Use a 10 watt sign lamp in the socket. A sign lamp lasts a long time and it is a good plan to change it about once a month even though it will last much longer. If the lamp burns out your alarm cannot ring. After the circuit passes through the lamp it splits into two circuits. One runs to the remaining lead of the series foil circuit and through the foil to ground. The other circuit travels through the knife switch and bells to ground. As long as the foil circuit at the shop is closed there is no voltage drop across the bells. The lamp on the panel is lighted. If the foil is broken or the wire is cut leading to the panel board, the light goes out and the bells ring until the switch is opened or the trouble is corrected.

Now suppose the foil tape is accidentally broken on one of the doors or windows and you cannot close in the alarm at night when you are ready to leave. First check all doors, windows, switches and bars to see that they are properly closed. We have a 10 watt test lamp with leads about three feet long. We test across each door and window till we find one on which the lamp lights at about half voltage. We then test down the panels or panes of glass until we locate the open circuit.

On the doors behind the bars we have a switch that is open except when the bar is in its proper place. On the office door we passed the circuit through the night latch so that it must be sprung in order to close in the alarm. This prevents a door from being carelessly left unlocked.

Fire detectors can be inserted in the circuit to sound an alarm in case of fire. You should be sure to specify fire detectors for a closed circuit when ordering.

We have had only one false alarm since our system was installed. It was due to the moisture freezing on the panels of the office door and breaking the foil.

? ?

The Question Box

Readers are invited to send their problems pertaining to the servicing of household refrigerators and small commercial refrigerating equipment as well as oil burners to "The Question Box."

? ?

OIL TROUBLES

QUESTION 375: What brands and viscosities of oil are used as a "factory fill" for the following units: Kelvinator, SO_2 and Methyl units; Frigidaire, SO_2 and Freon-12 units; General Electric, SO_2 and Freon-12 units; Lipman, Methyl Chloride units; Chieftain, all gases?

In my service operations I am using Texaco Capella oils exclusively, and I would like to know the result of adding this oil to a unit already charged with another brand of oil, such as a white oil, for example.

What is the correct procedure on encountering a unit that, due to leakages, is low on oil, the brand of which is unknown? I have in mind a hardening room job, using some 800 feet of 1¼ inch standard iron pipe for wall coils, Methyl Chloride for the refrigerant, and no oil separator on the unit. This job, because of its size and the large amount of oil in circulation, presents quite a problem, as it was definitely low on oil, and I had no knowledge of the brand of the original charge of oil. However, I added sufficient Capella D oil, and so far, no harmful effects have shown up. What is your opinion of this?

Sometime ago, I had occasion to completely overhaul a Kelvinator cool room plant, comprising a Model F-11 condensing unit, coupled to an X5-100 low side float, flooded evaporator. Everything was emptied out, the whole plant thoroughly cleaned out, and everything made as good as new. The float valve had a new valve seat and needle fitted, and it was then recalibrated on a reliable fixture to Kelvinator's recommendation. The whole plant was thoroughly baked out under vacuum and recharged with the correct amounts of 75 viscosity Capella oil and Sulphur Dioxide, and then it was put

into operation. On starting up, it presented as pretty a case of oil logging as you could wish to experience. I decided to fit ebullators to the evaporator, and then everything functioned perfectly. What puzzles me is why it was necessary to fit ebullators when the unit had worked perfectly for years without them.

ANSWER: The only information we have been able to gather from these manufacturers is that it is Kelvinator oil, Frigidaire oil, etc., and no viscosity is given. In other words, it seems that the manufacturers desire that the oil be purchased from them and therefore they specify only their trade name on the oil and apparently require that you give them the model number of the machine so they may determine the viscosity of the oil to be used.

As a general rule, however, oils of from 100 to 150 viscosity are used on sulphur dioxide work, while oils from 250 to 300 viscosity are used on methyl. For Freon the viscosity may be as high as 350 or 400.

Factors Governing Viscosity

There are several factors to govern the viscosity of the oil apart from the refrigerant used. One is the type of compressor or, in other words, whether it is a rotary type or reciprocating type; another is tolerances allowed in the working parts of the compressor, and a third is the class of work the refrigerating system will be doing.

Presumably, after a machine has been in use for some time such as, we might say, two years, the viscosity of the oil used might be heavier since the parts have become somewhat worn and there is a greater amount of clearance between these moving parts.

There is one unit which departs very greatly from the outline given and that is the General Electric hermetically sealed unit employing SO_2 as the refrigerant. In this unit a white oil of approximately 300 viscosity is used as the lubricant. The probable reason, however, for such a heavy oil in this unit is that they use a small heater in the crank case which prevents the oil from becoming too heavy.

I would say that in the case of the hardening room which you mention that the Capella D oil would be quite satisfactory. It is possible, however, that it is a better plan to remove all the old oil from the compressor before adding oil of a different kind such as you have done. It seems it is always logical to remove the old oil in any machine so that the entire charge will be clean instead of adding good oil to dirty oil thus having a larger quantity of dirty oil.

In the case of the Model F-11 condensing unit I would be of the opinion that the 75 viscosity oil would be entirely too light for this system and that your trouble with the system is due either to oil pumping, or it is possibly due to the calibration of the floats. If the float were adjusted to a lower level than that used in its former operation there would be a heavy blanket of oil permitted to remain on the top of the liquid refrigerant in the float, thus presenting an oil bound condition. I believe if you use about 150 viscosity oil in this machine, instead of the 75 viscosity, the general conditions will be better.

BEER COOLING SYSTEM

QUESTION 376: A customer of mine wants me to install a Coltrol D-X beer cooler in his bar, in which he is now using ice. He also wants me to replace two flooded fin coils in a walk-in cooler with a blower type unit cooler.

The constant pressure valve on the Coltrol D-X beer cooler will have to be set for 0 lbs. back pressure to produce 40 degrees beer, using SO_2. Here is the problem that sticks me.

The Peerless Unit Cooler Company recommends that for proper pressure control setting, compressor at shutdown should be operating approximately 18 degrees lower than the box temperature desired. If the box temperature is to be held at 45 degrees, then 18 degrees less will be 27 degrees, or a cut-out point of approximately 6 lbs., using SO_2. With this setting, the beer cooler would not pull down cold enough. Any suggestion from you will be appreciated.

Some other service company has sold him on this hook-up, but as I have been doing his work for sometime, he wants me to do the job for him. Sometime ago, he asked me about installing a beer cooler, using the same compressor that is handling the walk-in cooler. At that time, I figured the B.t.u. load of the box, and from my calculation, found that the compressor would not have sufficient capacity to handle both jobs. This other service company has assured him that the compressor will handle both, and I am giving the figures on which I base my calculations below.

Maximum outside temperature....98 degrees
Box temperature at present.....48 degrees

Temperature difference .....50 degrees

Dimensions of box—8 ft. x 8 ft. x 6 ft. 4 inches outside; 7 ft. 4 inches x 7 ft. 4 inches x 5 ft. 10 inches inside.

Corkboard—2½ inches.

One layer of ¾-inch wood inside and outside.

Outside of box—331 sq. ft.

Inside of box—314 cu. ft.

Heat conductivity through walls—34,755 B.t.u. per 24 hours.

Service loss—About twelve 25-gallon barrels of beer with a small amount of vegetables and some meat—25,120 B.t.u. per 24 hours.

Total heat loss—59,875 B.t.u. per 24 hours.

For a normal running time of 16 hours—3,742 B.t.u. per hour.

The compressor is a ½-hp. Kelvinator with a rating of 23 lbs. I.M.E. per hour. Am I right in my calculation, or will this handle the beer job also, assuming they will draw about 25 gallons of beer an hour?

ANSWER: Controlling of temperature in two different fixtures connected to the same unit in which different temperatures are required is quite simple with the use of a two-temperature snap-action valve.

Needs Two-Temperature Valve

In your particular case, I would suggest that the pressure control on the unit be set for zero pounds pressure, which is the cutout pressure required on the Coltrol DX cooler. Then, I would install a two-temperature snap-action valve in the suction line of the Peerless cooler, setting it for a cutout of 6 lbs. and a cutin of about 22 lbs. In this manner you will obtain the difference in temperature you require and with no possibility of too low a temperature being obtained in the walk-in cooler.

Another method of doing this is to install a thermostat in the walk-in cooler which will control a solenoid valve in the liquid line leading to the Peerless cooler. A thermostat in this case would be set for the temperature desired in the refrigerator.

With regard to your leakage calculations, I find that your figures are approximately correct; however, there is some information which you have not given me and which would have considerable bearing on the matter of whether or not the machine will handle the entire job.

I take it for granted that the beer is precooled in the walk-in cooler and may or may not be cooled to the eventual temperature desired for serving. However, regardless of this point, cooling of this beer is only going to be done once providing there is no loss in the lines between the walk-in cooler and the Coltrol.

Therefore, it would seem that since you have already calculated the heat loss in the twelve 25-gallon barrels of beer that there would be no additional load added by the Coltrol with the exception of possibly some loss through the walls of the Coltrol itself.

I can't determine from your description whether the beer is kept in the precooler and the lines connected from it to the Coltrol, or whether this precooler merely acts as a storage place and the barrels are removed from there and placed in some other compartment when connected to the Coltrol. If the latter is the case a large part of this cooling of the barrels will be done twice, whereas in the first case it is going to be done once only—either by the Coltrol or by the precooler. The total load, however, would be the same.

VARNISH ON WINDINGS

QUESTION 377: I recently removed a stuck compressor from a Grunow Model "K" household refrigerator. The varnish from windings caused the stick-up, and I want to know what causes this, and what can be done to prevent repetition. Also, the best method of removing the coating from working parts, including the evaporator and lines.

I have a new receiver and capillary meter, and have removed the varnish from the compressor parts with lye water. Would "Icex" cause such a condition in the machine?

The unit has been worked on formerly by other servicemen, with only temporary results. The wattage on the name plate is 210 watts. Would a 3-amp. thermal cut-out be satisfactory? Can the oil and gas be reclaimed after being contaminated as described above? If so, how?

ANSWER: The basic cause of your trouble with the Grunow Model K unit is that it has evidently been rewound and varnish or shellac has been used on the windings.

In all hermetic machines varnish or shellac on the windings is omitted. The usual practice is to use a double cotton-covered wire which is delinted before winding and no shellac or varnish of any kind is used. Enameled wire has been used, but I have no information on its success.

It is quite possible that Ice-X would act as a solvent on varnish, although I am not sure on this matter and it seems irrelevant in this case since other things could cause the same condition.

Moisture in the system which will cause an acid condition would dissolve the varnish and permit it to flow through the system, with the refrigerant.

I have my doubts if you will ever have any success with this unit unless it is again rewound and the shellac or varnish omitted.

For a motor which has a rating of 210 watts, it should be equipped with a thermal cutout of 2.5 amps. As a general rule thermal cutouts are rated at about 25 percent over the input of the motor.

It is quite probable that oil and gas can be reclaimed after being contaminated through use in the system; however the equipment necessary and the rather doubtful results would make it entirely too expensive to be worth while.

I would consider it a much better practice to use new oil and refrigerant when recharging.

TESTING THERMOSTATS

QUESTION 378: Will you kindly let me know what is the proper operating head pressure for a Methyl household job operating an 80-degree room temperature?

The suction pressure of 4 lbs. holds well, but opening and closing the expansion valve does not change the pressure in the least. The head pressure gauge reads 85 lbs.

This job operated fine all summer during the warmest weather, but when the weather turned cool, it started erratic operations. By this, I mean it would remain off cycle for up to 2½ hours at a time, and then would run continuously from 1½ to 2 hours, sometimes three hours. The condensing unit is in the basement, and the refrigerator on the floor above. The average temperature around the condensing unit is 70 degrees, and not lower than 65 degrees at any time.

Also, I would like to know if there is any positive method of testing a cold control before installing it in the unit. I purchased two new ones sometime ago, and they will not function at any point.

ANSWER: The operating head pressure for a methyl chloride system with a 4-lb. back pressure in an 80 degree room would be about 114 lbs. However, according to your letter, you state that the unit is installed in the basement and that the temperature of that basement is 70 degrees and not lower than 65 degrees.

As you probably know, the head pressure of the unit is governed by the temperature of the air passing over the condenser and not by the temperature of the air surrounding the cabinet; therefore, if the temperature of the air around the unit is 70 degrees the head pressure should be 96 lbs., and if the temperature of the air is 65 degrees the head pressure should be 87 lbs.

From this information and from the fact that you have stated the head pressure the machine is now operating on is 85 lbs. it appears as though the system is short on refrigerant.

The only reliable method of determining head pressures in a system is through the use of a head-back pressure calculator which is designed for this specific purpose. They are a very useful tool in service work and well worth the small purchase price.

One method of testing cold controls before installing is to make a small oil well from any sheet metal and insert in it the feeler bulb of the thermostat together with a pocket thermometer, then fill the well with oil, alcohol, or any other liquid of a low freezing point; then, with the drum of methyl turned upside down permit liquid refrigerant to blow on the oil well.

The temperature of the thermal bulb and pocket thermometer will be brought down quite rapidly and the actual temperature at which the thermostat will operate can be noted on the thermometer.

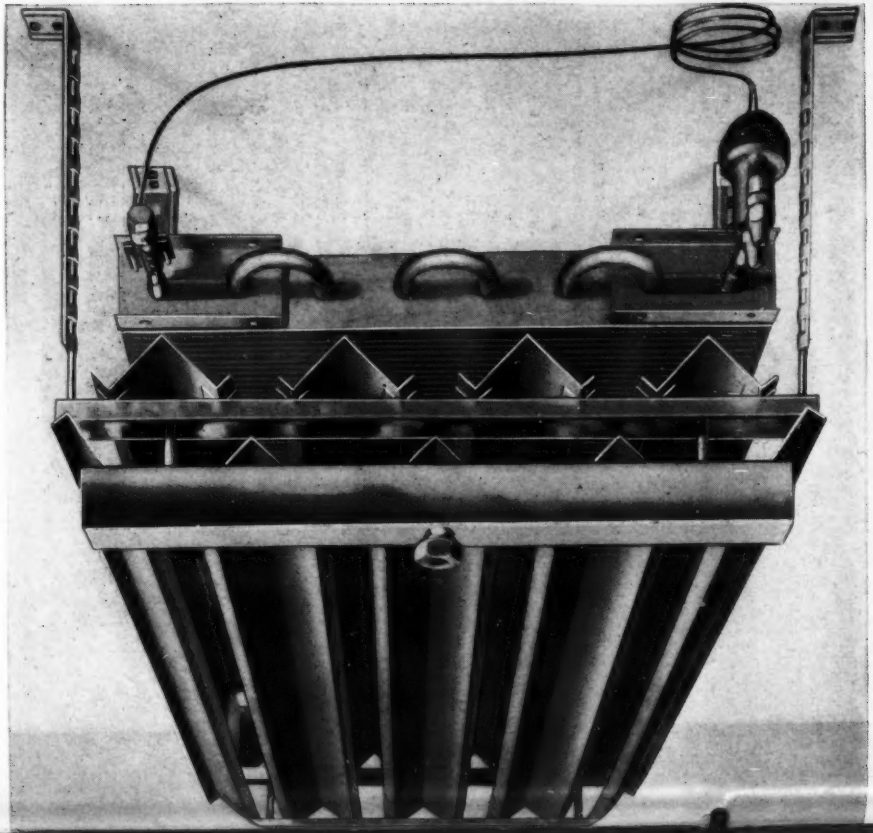
After the thermostat has snapped to the off position the oil well may be allowed to warm up until it again snaps to the on position at which time the temperature may again be noted. In this manner you can get a very close check on the on and off temperature settings of the thermostat.

CROSLEY DOES NOT FREEZE

QUESTION 379: I have a Crosley model that worked fine until we had a storm here and the current went on and off several times. I have put in new valves, and service valves, a new crank shaft, new rotary brushes, a new bolt, all new gaskets, 15 ounces of new oil, and 2 lbs. of SO_2. I have also refaced the shaft, cleaned the motor, and refaced the armature. The machine will make a head pressure of about 60 lbs. at 70 degrees room temperature, and a suction pressure of about 5 lbs. The evaporator temperature is about 30 degrees, and the box about 40 degrees in five hours run; it will sweat, but will not frost.

I let the compressor set overnight while I was working on it, with the piston down and the cylinder filled with oil; it did not leak past the piston.

End view of typical installation of Fedders Single Row Coil and Twin-Deck Baffle mounted with Fedders Adjustable Hangers. Note over-all width of baffle extends beyond width of coils.



NEW fedders TWIN-DECK DRAIN BAFFLES

DELIVERED COMPLETELY ASSEMBLED

If you can suggest anything to do to it, I would like to know.

ANSWER: I take it for granted that the Crosley refrigerator you are working on is one equipped with the capillary tube, and therein possibly lies your trouble. The capillary tube type of system is very critical in the amount of refrigerant which it contains.

If a few ounces too much is put into the system the machine will probably run almost continuously and and the evaporator and suction line will sweat. On the other hand, if insufficient refrigerant is contained in the system the unit may run excessively and the evaporator may or may not frost, dependent on how much refrigerant is in the evaporator.

Has Overcharge

From the description you have given me I am inclined to believe that this refrigerator has a slight overcharge of refrigerant. I would suggest that you purge off enough until the evaporator frosts over entirely and frost appears on the return line for a distance of three to four inches from the evaporator.

GUMMY METHYL SYSTEM

QUESTION 380: I have recently worked on a ½-hp. Methyl Chloride compressor. On the off cycle, the compressor would stick so tight that it would have to be turned over by hand before it would run again. I took the compressor apart and found a brown sticky substance like shellac or varnish, which would dry rapidly when exposed to the air. I soaked the compressor parts in gasoline and removed most of the coating, which was over every part inside of the compressor, then I thoroughly cleaned them with carbon tetrachloride. I blew the gas and oil charge out of the receiver, condenser, and evaporator coils, and recharged the system with a good refrigeration oil and gas. The system ran three days, and at that time, I had to go back. I found the expansion valve stuck closed with the same substance. I soaked the valve in carbon tetrachloride, and when it had loosened the gum, I blew out the valve with liquid refrigerant. Since then, it has been working all right.

What caused this condition? Do you think that the receiver, condenser, and evaporator coils should be cleaned out? If so, how and with what? This is an ice cream cabinet.

ANSWER: The brown gummy substance which you found in the methyl chloride compressor is probably resin. As a rule, resin in these compressors is formed by the combination of a small amount of sulphur dioxide, moisture and methyl chloride, although it is possible that the same substance can be formed from moisture and methyl chloride only.

It is quite common in those systems where a small amount of sulphur has been used as a means of giving an odor to the refrigerant or to the system that has been changed from sulphur to methyl and the sulphur has not been entirely removed. It is quite probable that this substance has permeated the entire system and eventually you will find it necessary to clean all the parts.

Alcohol is usually the best solvent for the material and I think that if you will wash all the parts in a good grade of alcohol; then after the gummy substance has been entirely dissolved and the alcohol removed, wash them again in carbon tetrachloride to remove the alcohol. The system can then be dried in the usual manner through pumping a vacuum and applying heat.

Albert Kleiner
California

The best thing about your magazine is that it is practical for every day use.

REFRIGERATION SERVICE ENGINEERS' SOCIETY

Official Announcements of the activities of the National Society and Local Chapters appear in this department as well as articles pertaining to the educational work of the Society.

THE OBJECTS OF THE SOCIETY

To further the education and elevation of its members in the art and science of refrigeration engineering; for the reading and discussion of appropriate papers and lectures; the preparation and distribution among the membership of useful and practical information concerning the design, construction, operation and servicing of refrigerating machinery.

ASSOCIATION HEADQUARTERS: 433-435 North Waller Ave., CHICAGO, ILL.

NEW CHAPTERS RECEIVE CHARTERS

LONE STAR CHAPTER

ON Monday evening, June 17, a representative gathering of refrigeration service engineers and their ladies met at Lang's Cafeteria where the recently formed Dallas chapter of the Refrigeration Service Engineers Society received its charter from National Secretary, H. T. McDermott.

In accepting the charter for the chapter, President H. W. Cline stated that it would be the purpose of Lone Star Chapter, as the first constituted chapter in Texas, to cooperate and further extend the work of the National Society.

A number of representatives of the larger manufacturers were present and remarked upon the advancement of the National Organization and the splendid work it was accomplishing in the furtherance of its educational program.

OIL CAPITAL CHAPTER

ON June 19, members of Oil Capital Chapter, Tulsa, Okla., met in the offices of the Machine and Tool Supply Company to receive the charter for the chapter from National Secretary, H. T. McDermott.

Oil Capital Chapter is the first organization in the state of Oklahoma, and from this chapter it is expected that several other chapters in the state will be formed within the near future.

ILLINOIS ASSOCIATION PLANS FOR STATE PICNIC

ON June 16, the Board of Directors of the Illinois State Association met in the Lodge at Starved Rock to consider further plans for the holding of a state picnic, as well as the Illinois Association Annual Convention. The meeting was presided over by President R. C. McCarthy of

Rockford, and the Board members included L. P. Millen, Aurora Secretary, A. D. McGill, Peoria, Floyd Duvall, Chicago, Walter Larson, Rockford, and Glen Dresback, Bloomington. Willis Stafford, National Director, was also present.

The Illinois State Convention stickers were presented and will be distributed to encourage attendance at this state association meeting. Plans were discussed for the state picnic, which will be held at Starved Rock on July 28, and William Metcalf was appointed chairman of the entertainment committee. Walter Larson was appointed to arrange for the refreshments.

All members of the Society and their families in Illinois and surrounding states are invited to participate in this event, and a good turnout is expected.

ROCKFORD, ILL. HOLDS ANNUAL PICNIC

A MOST successful event was held on Sunday, June 30, being the annual picnic of Rockford Chapter. The event was held in the Forest Preserves about ten miles from Rockford, and visiting Society members and their families included representatives from Madison, Milwaukee, several points in Illinois and Iowa. About 250 were present to participate in the picnic games that had been planned for the enjoyment of all.

Chapter Notes

Under this heading will appear news of the chapter meetings. For names of the officers and dates of regular meeting nights, please refer to the Chapter Directory.

CENTRAL INDIANA CHAPTER

June 5—The meeting was held in Herbert Hale's repair shop at Kokomo, Indiana. The main feature of the evening was a demonstration by Mr. Adams of the Red Cross on artificial respiration as a means of reviving victims of gases. This was followed by several discussions on the subject of moisture in refrigerating systems, which brought out much interesting information and took up the remaining part of the evening.

June 27—The Secretary was instructed to send a letter of thanks and appreciation to the Red Cross for its First Aid demonstration of the last meeting.

The balance of the meeting was devoted to the Question Box, which was filled with very interesting questions. Vern Nold invited all the members of the chapter to meet at his home in Marion, Indiana, on July 2. The meeting would be devoted primarily to a get-together, which would permit the families of the members to get acquainted.

COLUMBUS CHAPTER

May 9—A soldering contest was the main feature of this evening, and because of the time required, all business was postponed until next meeting. F. F. House of Mueller Brass Company was introduced and immediately proceeded with a discussion on the installation of valves, dryers, filters, and similar accessories, concluding his explanation with a demonstration on how to use solder. Mr. Hill of the Mueller Brass Company was also present, and extended greetings and good wishes from the Mueller Brass Company to the chapter.

The attractive display of valves, fittings, and so forth, was thoroughly inspected by the group.

The contest got under way, with Messrs. Dewitt, H. Wyatt and H. G. Klugman acting as time keepers. F. F. House, Mr. Barrows, and E. Merrill Brethauer acted as judges. The contest was conducted in three groups of two each to a group. John Gay of the Ebco Manufacturing Company and Robert J. Creamer of the Commercial Refrigeration Service Company made up the first group. The second group consisted of Bill Foster of the Westgate Electric Shop and Leroy Suttner of the Leroy Suttner Company, and the third group consisted of C. W. Belt of the Union Electric Shop and Jack Cartwright of Sears Roebuck Company. C. W. Belt, the winner, finished in eight minutes, fifty seconds, while others finished in time ranging up as high as twenty-one minutes, twelve seconds.

During and after the contest, refreshments were at the disposal of the members and their friends, and there was a feeling among the assembly that a good time was had by all.

LOS ANGELES CHAPTER

May 29—The meeting was held at the headquarters of Refrigeration Engineering, Inc. The local chapters of A.S.R.E. and N.A.P.R.E. were invited as guests of the chapter, and approximately two hundred

EVERY PAR UNIT
TESTED
UNDER ACTUAL OPERATING CONDITIONS!

It's not enough to know that every piece of material and every individual part is painstakingly finished to accurate tolerances — nor can we be satisfied with a casual test after final assembling. Every individual Par unit has to stand up under a thorough-going operating test. Each completed unit — compressors, condenser and receiver is subjected to high temperature, under 25″ vacuum to eliminate any trace of moisture . . . then charged with refrigerant and run in for 24 hours under actual refrigeration load . . . carefully checked for noise, valve efficiency and leaks—an adequate operating test for every Par before it starts doing work for you.

Par Condensing units are made in both air cooled and water cooled models 2 or 4 cylinder, 30 sizes to fit the needs of any application from 1/5 to 20 H. P.

Send for FREE CATALOG
or see PAR units on display at your jobbers.

MODERN EQUIPMENT CORPORATION • DEFIANCE, OHIO

LOS ANGELES MEETING AT RECOLD FACTORY

1. One of the two groups which heard the lecture on the Recold laboratory apparatus. J. C. Blair, Educational Chairman, standing at extreme right. 2. Left to right: James Rodgers, Walter Hancock, and John Payne, President, watch John McCown operate a production swedging tool. 3. And beer was served. 4. H. H. McAdam, Recold Engineer, stroboscope in hand, explains the operation of the instrument in checking fan speeds.

people were in attendance at the meeting. The meeting took the form of an inspection of the Recold Coil manufacturing plant, and there was no business of the chapter conducted. A very interesting educational talk and demonstration of the complete testing apparatus in Recold's laboratories was given by H. H. McAdam. It was necessary for Mr. McAdam to give this talk twice as the crowd was so large that the laboratories could not accommodate all of them. An inspection of the entire plant was made by every one present, and some of the members inspected a new low temperature installation in the ice cream department of Ralph's grocery, which used a Recold water defrost coil, and was maintaining a minus-20-degree temperature.

The hosts of the gathering, Hy Jarvis and Walter Hancock, furnished refreshments for the entire crowd, and several pictures were taken by L. P. Roth of Refrigeration Service, Inc.

June 12—The meeting was devoted primarily to a general discussion by the members present, during which many interesting experiences of the members were brought out and discussed, giving an insight into some of the unusual classes of work encountered.

ST. LOUIS CHAPTER

May 9—Chairman of the Educational Committee, E. E. Gygax spoke briefly on the progress being made by the Code Committee and gave assurances that further reports would be made at other meetings.

A paper on frozen foods prepared by E. Gygax, dealing with the cultivation, preparation, distribution and resale of frozen foods was read by A. H. Huhn. Mr. Huhn expressed regret over the fact that a film on frozen foods had failed to arrive in time to be used in conjunction with the paper.

May 23—Much of the business of the evening was postponed till a future meeting in order that the program for the evening should be given as much time as possible. Also, since many of the members wished to attend the Frigidaire clinic, being held in the same building, they were being given an

GET THAT REPLACEMENT BUSINESS THE EASY WAY!

Invariably replacement selling quickly gets down to Product and Prices—and how much easier it is to get the order if you have something *new* to demonstrate and sell.

With Kelvinator you not only have a well-known name but you also have *new features* that are easily and quickly demonstrated. Just one example is the tremendous improvements in features and design in Kelvinator condensing units. They are more compact, require less headroom and yet deliver an average of *30% more refrigeration capacity* per dollar investment than units built just a few years ago.

To clinch your story that *now* is the time to buy, you can offer low 1940 prices with Kelvinator. These new prices are the result of careful planning to combine even *greater value* at *lower prices.*

When you can talk new products, new features and new low prices your prospects will listen. You can do all this if you tell the Kelvinator story.

Fill out the coupon for complete information on Kelvinator's Condensing Units, Reach-in Refrigerators, Water Coolers, Beverage Coolers, and Frosted Food Cabinets.

26 Years of Success in Refrigeration

KELVINATOR

The Complete Line, Completely Built by One Company

Commercial Sales, Kelvinator Division,
Nash-Kelvinator Corporation, Detroit, Mich.
Gentlemen:
Please send me complete information on the Kelvinator line of Commercial Equipment.

Firm .....

Name .....

Address .....

City ..... *State* ..... (K-99)

opportunity to get away early.

Bob Cook, representing Ranco controls and Bush coils in this territory gave a brief talk on these products and assured the members that he would be glad to help them on any particular application they might be confronted with.

Herman Goldberg's film of scenes at the Sixth Annual All-Industry Convention was shown following the talk.

June 13—As no speaker had been scheduled for the evening, the time was spent in a discussion of arrangements for this year's annual picnic. E. C. Fix, chairman of the Entertainment Committee, was given the benefit of the views of the members and was asked to report at the next meeting the attitude of jobbers based on these views.

An interesting film entitled, "A Day With the Sun," concluded the meeting.

PITTSBURGH CHAPTER

June 14—The meeting was held in the quarters of the Minneapolis-Honeywell Company with S. C. Perry presiding. A short business meeting was held and reports were received from various committees. S. C. Perry introduced Mr. Tracey of the Minneapolis-Honeywell Company, who welcomed the members to the new quarters in Pittsburgh. Mr. Tracey then introduced Frank Wallbridge, who showed a series of slides and explained the operation of the Minneapolis-Honeywell controls.

Refreshments provided by the Minneapolis-Honeywell Company were served following the meeting.

MADISON CHAPTER

May 14—The meeting was held in the offices of Gustave A. Larson Company, and after the usual routine of business was dispensed with, the meeting was turned over to William Pennewell, who gave an interesting talk on Trigger Control, manufactured by Peerless of America, Inc.

Beer was furnished by Gustave A. Larson Company and enjoyed by all present.

June 11—Among other business of the evening discussed and reports given by various committees, the date for the State Association picnic was set for September 15, 1940. It was also decided that prizes awarded this year will be given to paid members of the Society only. Mr. Buschkopf stated that the Fox River Valley Chapter would like to help at this picnic, and it was decided to let them take care of the games and prizes for the ladies and children. Mr. Buschkopf further suggested that a letter be sent to each member informing them that the annual dues were now due.

LONG BEACH CHAPTER

June 6—The first business of the evening was an annual election of officers which resulted in the following: *President,* E. F. Brown; *1st Vice President,* D. Voorhis; *2nd Vice President,* J. George; *Secretary,* H. R. Casler; *Treasurer,* L. K. Willis; *Sergeant-at-Arms,* G. Holmes. Following this election, a three-reel colored movie, taken by Herman Goldberg at the National Convention, was shown, and in addition, John Engel, a member of the chapter, showed a one-reel film of local men in action at different locations.

After the movie, the new president, E. F. Brown, was installed in his new office and was extended all good wishes for the coming year by those present.

TRENTON CHAPTER

June 3—The new officers of the chapter recently installed are as follows: *President,* Donald Peresett; *1st Vice President,* George Frie; *2nd Vice President,* Fred W. Homeier; *Secretary,* Franklyn R. Beemish; *Treasurer,* William H. Funkhouser; *Sergeant-at-Arms,* Samuel Cohen; *Educational Chairman,* Harry Jaeger.

On the educational program for the evening, Harry Jaeger introduced Mr. Thompson of Minneapolis-Honeywell Regulator Company, the guest speaker of the evening, and Mr. Jaeger added during the introduction that the refreshments for the evening had been supplied by Mr. Thompson and Minneapolis-Honeywell Company.

Some discussion arose as to the advisability of holding a chapter fishing trip, and John Plumeri, Samuel Cohen, Harry Jaeger, and Doc Aaronson were appointed as a committee to make arrangements.

Following the business of the evening, Mr. Thompson presented a very interesting talk on controls manufactured by the Minneapolis-Honeywell Company.

TRI-COUNTY CHAPTER

May 3—The chairman of the educational committee introduced A. B. Davis of the Mine Safety Appliance Company, who gave

Use IMPERIAL TRIPLE-SEAL FITTINGS

. . . they are LEAK-PROOF even when the seat has been badly nicked or marred

AIR conditioning and refrigeration men everywhere tell us that Imperial Triple Seal Fittings have greatly simplified the job of making tight connections that stay tight. For the first time it is possible to make up tight joints from fittings where the seats have been nicked or marred by being dropped or knocked around. When Triple Seal fittings are used there is no need to reface such fittings.

On your next job be sure and use Imperial Triple-Seal fittings. You will be surprised how easily they pull up into a tight, leak-proof joint . . . how they can be reconnected time after time and still hold under high pressures without the slightest trace of leakage.

All flared ends on Imperial refrigeration valves, strainers, floats, controls, etc., are now made with Triple-Seal connections. Be sure to ask for them when you order from your jobber.

● If you don't have the new 1940 Imperial Condensed Catalog, be sure and write for your copy. It covers all the Imperial products for installation and service work.

THE IMPERIAL BRASS MFG. CO., 1204 W. Harrison St., Chicago

IMPERIAL *Air Conditioning and Refrigeration Products*

VALVES • FITTINGS • TOOLS • CHARGING LINES • FLOATS • STRAINERS • DEHYDRATORS

an interesting talk on gas masks and their uses. The next speaker for the evening was V. C. Kelsey of the Commercial Standard Insurance Company, whose talk was based on insurance and safety.

May 17—During the course of the business session, plans for a picnic, to be held in the near future, were thoroughly discussed, and committees were appointed to complete arrangements.

On the educational program for the evening, a two-reel film, supplied through the courtesy of the General Electric Company, was shown and enjoyed by all.

June 7—After the business meeting was completed, the members adjourned to the Western United plant where a conducted tour of the air conditioning system was made, beginning with the compressors, filtering systems, and so forth, in the basement, and proceeding on through the building to the roof, where the different types of room coolers and evaporative condensers were shown. Moving on to the power plant of the building, the tour took in the different steps necessary in producing electricity. Several types of coal stokers, boilers, and steam turbines to operate the generators, were shown. The different voltage circuit breakers and transformers, and the methods of connecting various communities so that there is practically no interruption in service were also explained. This tour was one of the most interesting and educational features of any meeting held to date.

June 21—Lawrence Millen announced that the Illinois State Picnic would be held at Starved Rock on July 28.

The educational program consisted of a demonstration and movie presented by the Detroit Lubricator Company on the new Duro-Fram expansion valves. Don Gott and T. C. McKee put on the program and answered numerous questions. The meeting was well attended and proved to be interesting to those present.

PHILADELPHIA CHAPTER

May 13—In making arrangements for future educational programs of the chapter, Mr. Russel, assigned to the committee on this work, made a report of replies received from various companies to date. During the course of the business that followed, it was agreed to dispense with the meetings during the months of July and August.

D. Smith, introduced on the educational program, gave an interesting talk on ice cream cabinets and service problems connected with them.

KANSAS CITY CHAPTER

May 28—Considerable time was taken up with discussions on the pending refrigeration code. Mr. DeWilde made a lengthy report on cities in the State that have been contacted and on the reactions of Mr. Burns of the Kansas City Safety Council.

The educational program of the evening consisted of a quiz contest conducted by R. E. Meeker and F. A. Thompson. The contest proved very entertaining.

CENTRAL NEW YORK CHAPTER

May 8—A discussion on the future meeting place brought about the decision to meet at the YMCA hall on the second and fourth Wednesdays of each month, except on occasions when the program would call for meetings in other places providing a different type of accommodation. During the business session that followed, President Harder appointed the following committees: Educational, Harold Wood and Ted Glou; Membership, William Menzies and Fritz Harder; Sick Committee, H. Persett, W. Andrews, and F. Harder.

May 22—The meeting was held at the Dairyleas Ice Cream Plant, where, after the business of the evening was disposed of, Paul Cross spoke at length on problems arising in the refrigeration of ice cream and its related products.

WESTERN MASSACHUSETTS CHAPTER

The chapter recently reported the election of its officers for the ensuing year. They are as follows: *President,* Charles Adams; *1st Vice President,* Fred LaFleur; *2nd Vice President,* James Vye; *Secretary,* Harold Lambert; *Treasurer,* Walter Quimby; *Sergeant-at-Arms,* Earl Fassell; *Educational Committee,* Frank Meyer and Arthur Hebert; *Board of Directors,* Carl Page, F. Ben Lindberg, and William J. Plante.

TRI-STATE CHAPTER

June 8—The meeting was held in Ashland, Kentucky, and called to order by 1st Vice President, Forrest Poole. After conducting the business end of the meeting, it was turned over to a general discussion on service problems. Considerable good was derived

from these discussions, and all the members joined in with their contributions of opinion.

A report of the chapter picnic held at Armco Park, south of Ashland, Kentucky, for all members and their friends, brought out the fact that every one had a very enjoyable day. All members who came brought steak, and every one enjoyed an old-fashioned steak fry. Children, large and small, had a good time playing games and riding the rides at the park, and taking in every other available amusement.

WHITE-RODGERS PRESSURE CONTROLS

WHITE-RODGERS selective range pressure controls are designed to cover a relatively large range, but with provisions on the outside of the control to select a certain portion of the total range of the control for convenient adjustment.

These controls are provided with an internal dial, covering the entire range of the control. The external knob is equipped with two movable arms with which to select any portion of the dial range. The selected portion of the internal dial is visible through a viewing window from the outside of the control. The large pointer located in the exact center of the viewing window indicates the pressure at which the contacts open thus completing the cooling cycle.

The controls are provided with the sturdy, fully enclosed switch mechanism proven reliable on thousands of White-Rodgers Hydraulic action controls. The bellows assembly is so constructed that the working range requires exceptionally short bellows movement, thus greatly reducing the wear and strain on the bellows metal. Great care has been used in these control designs to eliminate the strain to which the conventional pressure switch, because of its demand for long travel—and therefore metal stretch—puts upon the bellows. Here for the first time the fatigue factor of the bellows metal has been reduced almost to the vanishing point.

The result is a control with a three to five times longer life than has been heretofore possible. The unique construction of the switch and bellows assembly without the conventional interlocking mechanism has created a single powerful unit of such positive calibration characteristics as to assure unvarying settings entirely free from drift in differential.

The sturdy construction of the switch used in White-Rodgers pressure controls is responsible for current and motor ratings for both A. C. and D. C. service that enables these controls to carry the load of heavy duty equipment without the use of relays.

WHITE-RODGERS CONTROL

The strong springs and powerful permanent magnet produce a positive snap-action and a positive contact. The switch mechanism is constructed of brass and plated steel parts. The fine silver double-break contacts and positive snap-action assure long contact life.

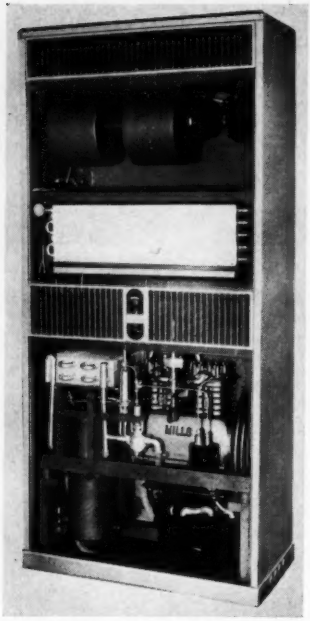
The switch mechanism is entirely enclosed to prevent entrance of foreign matter or injury from misplaced leads when being installed.

MILLS NOVELTY COMPANY "AIR PERFECTIONER"

MILLS NOVELTY CO., announces a self-contained store cooling unit in three and five ton capacities. This unit is known as the "Air Perfectioner." It is equipped with a Mills three h. p., four cylinder Freon-12 compressor, rated in accordance with standard A.S.R.E. method.

The cabinet is all steel, completely insulated, having a silver-bronze finish. The "Air Perfectioner" is 90 inches high, 42½ inches wide and 21½ inches deep. Three-ton model is 34½ inches wide.

The front panels of the unit are removable; right and left hand knockouts are provided for ease of installation and a fresh



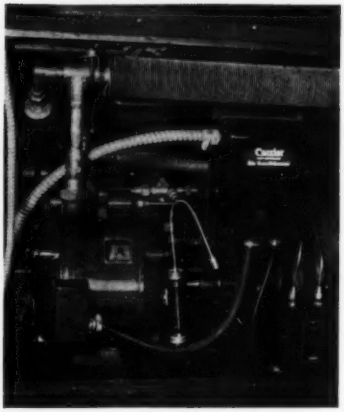
MILLS NOVELTY CO.'S "AIR PERFECTIONER"

air panel is provided at the rear below the coil and filter level.

Extra side discharge outlets are provided by simple removal plates, which are sized for standard registers or ducts. The front discharge grille is said to operate with a minimum of air noise.

The three-ton unit is equipped with a four-row coil and the five ton units with a five-row coil; steam or hot water coils for winter heating are optional on both models.

CONNECTING THE FLASHLIGHT EXTENSION



ONE OF THE MANY USES FOR THE EXTENSION

NEW FLASHLIGHT EXTENSION

FOR service engineers, and others requiring a closely spotted light in difficult-to-get-at places, a novel flashlight bulb extension has been developed.

Working around piping in restricted places, the ordinary flashlight is often inadequate. But with this new device not only is vision aided but both hands are freed to perform the task. This is made possible because the extension is bendable and can be made to hook on any object.

Inspection of pipes between studding, under floors, around stokers and burners; close examination of wiring and refrigerant lines; checking interior of pipes and illumination inches closer to an object are some of the advantages.

Known as the Sierra Flashlight Bulb Extension, it is made of special copper wire encased in aluminum alloy tubing.

ATTRACTIVE DISPLAY BOARD FOR TEMPRITE JOBBERS

TEMPRITE PRODUCTS CORP., Detroit, Michigan, has just introduced a new and attractive display board for the convenience of its franchised jobbers listed

"It's the Best Dealer Set-up a man could hope for!"

(Reading time 1½ minutes)

LISTEN *to this newly appointed G-E Dealer tell his banking friend about a good investment in personal security.*

"Morning J. B. Remember we talked about my taking on the General Electric lines? *Well, I'm now the G-E Dealer for this area.* You'll be interested in my new set-up:

Commercial Refrigeration

TESTED PRODUCTS

"In the first place—before G-E put a nickel's worth of refrigeration, cooling and heating products on the market eight years ago, they spent five years and many thousands of dollars making them *work.* And every year since, they've continued to spend plenty making them even better.

Cooling

"The net result is every customer gets a working piece of machinery that doesn't have to be serviced every few weeks. That *keeps* him happy.

"For instance — water coolers and beverage coolers. What the grocer or butcher or delicatessen man calls walk-in and reach-in cabinets. And condensing units. *(There's a steady replacement business in these alone.)*

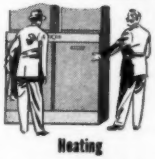
"Then there's the second complete line—of summer cooling units for one room in a home, for an office or for a whole store—with what we call G-E *'packaged'* air conditioning.

"And the third—*automatic* heating. *Gas or oil. Warm air or radiator heat.* Any combination to fit. To operate economically. To give the last word in comfort. And *efficient* control.

YEAR 'ROUND PROFITS

"As a good business man yourself, you'll agree with me that it makes sense to *sell all three lines.* Not just one as I used to. This means keeping everybody busy and *year 'round profits.* It's what you call straightening out the sales curves.

"Now, in addition to good products, G-E offers a dealer special training in selling, in engineering, in organizing sales and service groups. The dealer is backed up by national and trade advertising, direct mail and display, literature and co-operation on local newspaper advertising.



Heating

"There's the set-up—briefly. *Now you can see what it means to be a G-E Dealer!"*

GENERAL ELECTRIC

GENERAL ELECTRIC CO.
Division 199-471, Bloomfield, N. J.
I want details on the G-E Dealership for my territory.

*Name*_____

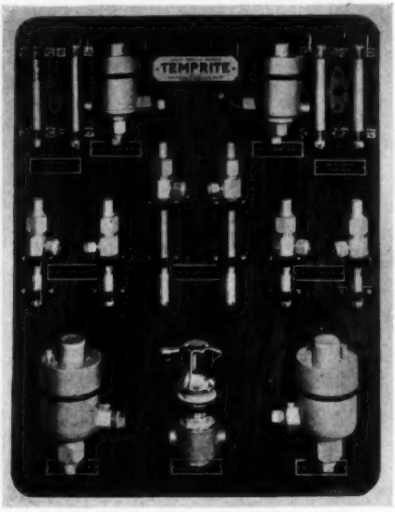
*Street*_____

*City*_____ *State*_____

on its two page display advertisement contained in this issue of THE REFRIGERATION SERVICE ENGINEER.

This board contains all the repair parts required for the jobbers' stock and all the new parts required for the 1940 coolers.

As parts become obsolete the jobber returns them to the factory for full credit and replaces them with current parts; in this way jobber repair parts for Temprite coolers are kept completely up to date and he is



The display board being supplied to Temprite jobbers.

enabled to serve the trade quickly and efficiently.

It will be seen from illustration on this page that the Temprite display board has real attention value and helps to identify the Temprite franchised jobber to the trade.

BIG AIRO PICNIC 21ST —SERVICEMEN INVITED

AIRO SUPPLY COMPANY, 2732 N. Ashland Ave., Chicago, invites all R.S.E.S. members to attend its 5th Anniversary picnic and celebration Sunday, July 21. An all-day program of games, contests, and other entertainment has been planned. Free beer, pop, and eats will be on hand for all.

Those wishing to share in the fun may obtain directions for reaching the picnic by dropping a card to Airo Supply Co.

THE D F N SERVICE TAG

THE McIntire Connector Company—producers of the DFN—have initiated an idea which they hope will be of assistance to the service engineer. It is in the form of a small red tag which details important facts concerning the type of drying agent that had been used on a system, the kind of refrigerant, date of installation, etc. This DFN service tag was announced in their advertisement in the May issue of THE REFRIGERATION SERVICE ENGINEER.

McIntire are now including one of these tags with each DFN when it is shipped from the factory and the idea is to attach the tag to the DFN after installation. When the drying agent, refrigerant and date of installation is checked it provides accurate information for the service engineer when he is again called on the job or makes his periodical inspection. In addition to proving accurate information of important details either for himself or for any succeeding engineer, it indicates that the original installer takes sufficient pride in the quality and completeness of his work to identify it. Its use will also increase the confidence of the owner of the system and when he again needs service he will call on the man who used it. If the date of installation is noted it will aid materially in securing the sale of a replacement. Having properly installed or serviced a system, any control or safety device employed can only reflect favorably on the ability of the service engineer. This being so, it should not be difficult to convince the owner (having convinced him in the first place that a good drier was good insurance) that a replacement would be a guarantee of continued trouble free refrigeration.

BAKER ICE MACHINE FOUNDER DIES

JOSEPH L. BAKER, a founder of the Baker Ice Machine Company and the United States Gypsum Company, died early Thursday morning, June 27, at Omaha, Nebraska. Mr. Baker was 85. He had been inactive the last two years and had been in the hospital since June 22.

Born in Massachusetts, Mr. Baker was educated there and in Rhode Island. He discovered that gypsum rock could be used in plaster to make a hard and waterproof finish, so in 1888 with two associates he bought a gypsum mountain in Blue Rapids,

Kans., and later other gypsum properties. He was on the original executive committee of the United States Gypsum Company, which was later sold to the National Gypsum Company.

The Baker Ice Machine Company, which he started with a partner in 1905, and acquired as sole owner in 1907, was started in a small shop in a one-story building at Thirteenth and Howard Streets in Omaha, Nebraska. Mechanical refrigeration became Mr. Baker's major interest and most of his time and effort were devoted to working out new ideas and developing foreign markets for the equipment. The firm grew to be of international importance and now exports equipment to 58 foreign countries. Mr. Baker retired in 1932 as president of the firm, and was succeeded by his son, Richard L. Baker. Another son, Chester A. Baker, New York, is vice-president.

Mr. Baker was a member of the Omaha Chamber of Commerce, and some years ago was active in promotion of waterways development. In 1930 the chamber presented him a scroll in gratitude for "valuable civic work." He was a former member of the board of directors of the National Refrigerating Machinery Assn., the Nebraska Manufacturers' Assn., the Universal Gypsum and Lime Co., and the Middle West Foreign Trade Assn. Mr. Baker had been a member of the Masonic lodge since 1878.

Surviving are two sons, Richard L., Omaha, and Chester A., New York; daughter, Mrs. Harry G. Kelly, Omaha; and seven grandchildren.

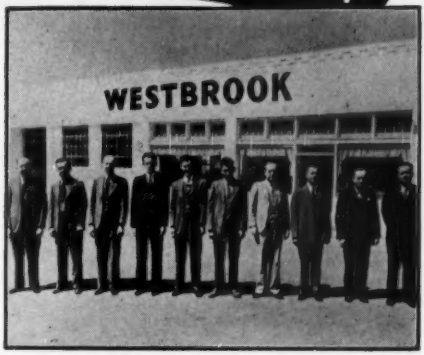
STANDARD PARTS CO. SELLS JOBBING BUSINESS TO ALTER

STANDARD Refrigeration Parts Company, after many years of service to the refrigeration industry, both in manufacturing and jobbing, have decided to discontinue all jobbing activities, and concentrate strictly on manufacturing refrigeration appliances, marketed under the name of Standard. The Standard Refrigeration Com-

DEPENDABLE REFRIGERATION Controlled

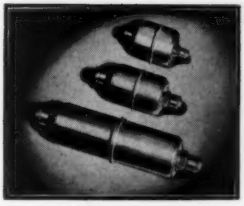
Sunny San Antonio boasts, among other advantages, one of the most modern, up-to-the-minute Refrigeration Parts Jobbers in the Industry . . . Westbrook's!

Display Shelves are filled with a complete selection of DEPENDABLE A-P Valves. Both Westbrook and their many customers have long ago proved the wisdom of *standardizing on A-P Valves for efficient and accurate Refrigerant Control* on Air Conditioning and Refrigeration Installations.



Protect YOUR Installations — with A-P Valves!

A-P offers DEPENDABILITY in a full line of Thermostatic Expansion Valves, Solenoids, Water Valves, Suction Pressure Valves, Oil Valves, Temperature Control Sets, and the new "TRAP-IT" System-Protectors.



New A-P TRAP-IT System-Protector against all Impurities.

A-P No. 215 Thermostatic Expansion Valve. Capacity 3 to 6 tons Freon.

Progressive Service Men Use and Recommend — and Aggressive Jobbers Stock and Talk — A-P Products.

AUTOMATIC PRODUCTS COMPANY
2454 NORTH THIRTY — SECOND STREET
MILWAUKEE WISCONSIN
Export Department, 100 Varick Street, New York City

pany's plant is located at 4639 Washington Boulevard, where their production facilities are now geared up to meet the ever increasing demand for Standard appliances.

The remainder of their inventory in refrigeration parts and supplies were sold in bulk on July 1, to The Harry Alter Company, large national jobbing house of refrigeration and air conditioning supplies and parts. In purchasing the former jobbing supply department of the Standard Company, The Harry Alter Company are again displaying their confidence in the future of the refrigeration supply industry. Former customers who previously bought their refrigeration parts and refrigerants from the Standard Refrigeration Parts Company are now being served by The Harry Alter Company, at any of their four supply houses located in Chicago.

Mr. Irving Alter, Secretary and Treasurer of The Harry Alter Company negotiated the deal with Mr. Harry Goldberg, President of the Standard Refrigeration Parts Company, and in consummating the deal, both companies look forward to continued success in their respective fields—Standard in manufacturing—Alter in jobbing.

NEW CONDENSING UNIT FOR TRUCKS

OFFICIALS of Frigidaire commercial and air conditioning division of General Motors Sales Corporation today announced the addition of a small condensing unit for refrigerated trucks to its line of mobile refrigeration equipment. This increases to four the various models of this type of unit now available in sizes from ½ to 1½ h. p., inclusive.

Because of the increased interest in equipping smaller refrigerator bodies, the new unit, which is a ½ h. p. unit, was especially designed to meet this new demand and completes a product line which allows for practically every type of truck installation.

The new units are ideally suited for proprietors of wholesale florist shops in the larger cities who make daily deliveries to shops in the smaller surrounding towns, wholesalers of frosted foods making scheduled deliveries to grocers on routes averaging 200 to 250 miles, and others engaged in similar businesses.

Mounted on a base constructed of welded

channel and angle iron sections, the unit is compactly built to occupy but little floor space. It is equipped with two cylinders, slow speed reciprocating type compressor, and uses a dual voltage, capacitor start, sleeve bearing motor with built in automatic reset overload protection. It is entirely finished in black baked enamel.

MARC SHANTZ TO HANDLE SUPERIOR LINE

ARRANGEMENTS have recently been made with Marc A. Shantz, Chicago manufacturers agent, to handle the Superior line of diaphragm packless valves, manifolds, accessories and fittings, in the territory including the northern portion of Indiana, Illinois and Iowa, the western portion of Michigan, and all of Minnesota and Wisconsin, according to K. M. Newcum, Vice President and Sales Manager of Superior Valve & Fittings Co.

Following his established policy, Mr. Shantz plans to work closely with the jobbers in his territory on the Superior line. His plans also include a warehouse stock of Superior products, for the convenience of jobbers and manufacturers in the Metropolitan Chicago area and nearby cities.

NEW CATALOGS AND BULLETINS

MINNEAPOLIS-HONEYWELL REGULATOR COMPANY of 2950 Fourth Avenue South, Minneapolis, Minn., has quantities of Polartron (refrigeration pressure controller) envelope stuffers and "refrigeration controls price lists" available for distribution.

The envelope stuffers are small four page folders attractive in appearance that tell a straightforward illustrated Polartron sales story of interest to jobbers and dealers.

The "refrigeration controls price list" is a six page folder briefly describing M-H refrigeration controls, including specifications, functions, applications and list prices.

MACHINE TOOL AND SUPPLY CO., 215 E. First St., Tulsa, Oklahoma, has issued a new refrigeration and air conditioning catalog of supplies and equipment. Containing 155 pages, the catalog is beautifully bound in a plastic loose-leaf binder and a three-

color cover. The tabular method of indexing provides a quick method of locating the items you want.

"We believe," states the company, "you will agree with us that this catalog is different. It has been printed as you, our friends and customers, have asked us to print it. Many of the features of this book are new to refrigeration and air conditioning catalogs but their value to you and your business can be readily seen.

"Yes—the catalog is new . . . but . . . the service behind the catalog is that same dependable service that has come to be accepted and expected as a regular thing by contracting and service organizations in this fast growing industry."

BOOK REVIEW

Commercial Refrigeration and Comfort Cooling. By Samuel C. Moncher. Published by The Refrigeration Service Engineer, 433 N. Waller Ave., Chicago, Ill. 112 pages. Hard cover. Price $1.50.

This book has been written for the purpose of presenting a comprehensive picture of the fields of commercial refrigeration and comfort cooling as they are today, with special emphasis on engineering methods in common use. No attempt is made to displace the standard texts and treatises on the subject, for it is assumed that the reader is already familiar with the fundamentals of refrigeration theory. The author has tried to adapt this book especially for engineers, architects, mechanics, salesmen, and others with a general knowledge of the field, who desire to gain a more thorough understanding of the industries of commercial refrigeration and comfort cooling as they are today.